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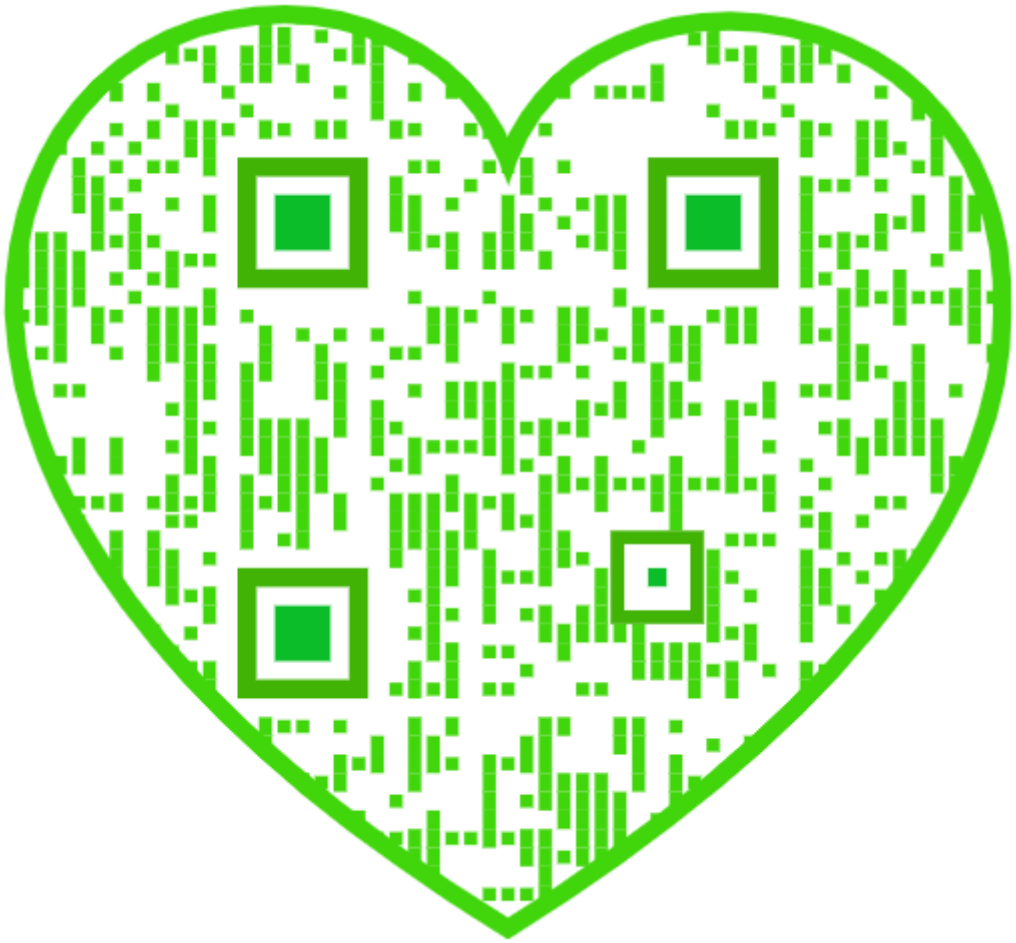
CORN BOOK *for* YOUNG FOLK

WILLIAMS AND HILL



CORN BOOK FOR YOUNG FOLK

UNIV. OF CALIFORNIA

BY

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PREFACE

If a young farmer can be led to acquire skill in growing one crop, he will unquestionably apply the principles that brought success in the one crop to all his other crops. The authors of this book, therefore, think it best not to confuse the mind of a beginner by a discussion of all the standard crops, but rather to teach the general principles of crop growing through their application to a specific crop. The fundamental principles, like seed selection, the preparation of a seed bed, tillage, rotation of crops, and control of moisture, are practically the same for all crops. The unessential differences, like methods of planting or harvesting, are easily acquired. Corn was selected because it is almost universally grown in our country.

One of the serious obstacles to the classroom study of a standard crop is that timely illustrative material cannot usually be secured. The teaching of the lesson cannot be made to correspond to the seeding, cultivation, or growth of the crop. The necessities of the school often require the class to be studying the root system of a plant when the snow is on the ground or its flowers when the plant itself is being harvested. To obviate this difficulty

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the authors have centered much of the teaching around carefully selected photographs which with absolute timeliness illustrate almost as clearly as natural objects do.

Hearty thanks for illustrations are accorded to the following: Bureau of Crop Estimates, Office of Corn Investigations, Office of Farm Management, and Office of Acclimatization and Adaptation of Crop Plants of the United States Department of Agriculture; to the Kansas and North Carolina State Departments of Agriculture; to the North Carolina Hall of History; to the Experiment Stations of Arkansas, Georgia, Illinois, Iowa, Kansas, Kentucky, Massachusetts, Minnesota, Missouri, Montana, Nebraska, New York, North Carolina, North Dakota, Tennessee, and Virginia; to the *Agricultural Gazette of New South Wales*, *Farm Business*, and *Ohio Farmer*; to the American Seeding Machine Company, S. L. Allen and Company, Deere and Company, Dunham Company, Eureka Mower Company, Ginn and Company, International Harvester Company, Rock Island Railway, Roderick Lean Company, and S. W. Wilkinson and Brother.

CONTENTS

CHAPTER		PAGE
I.	Importance of Corn Crop	1
II.	The Beginning of the Corn Crop	9
III.	Climate and the Corn Crop	17
IV.	Races of Corn	31
V.	The Growing Plant	45
VI.	Markings of Good Seed Ears	61
VII.	Markings of Good Seed Ears (Continued)	78
VIII.	Place and Manner of selecting Seed	93
IX.	Storing the Seed	113
X.	How to test Seed Corn	121
XI.	Soil for Corn	140
XII.	First Steps in Cultivation	150
XIII.	The Second Step in Cultivation	163
XIV.	The Third Step in Cultivation — The Seed Bed	175
XV.	The Fourth Step in Cultivation — Planting	182
XVI.	The Fifth Step in Cultivation — Tending the Crop	203
XVII.	Harvesting the Crop	215
XVIII.	Corn Silage	232
XIX.	Storing the Ears	239
INDEX		243

CORN BOOK FOR YOUNG FOLK

CHAPTER I

IMPORTANCE OF CORN CROP

Just as the Rocky Mountains tower over our other ranges, so corn towers in value over our American crops. No other crop occupies so many acres; no other sells for so large a sum. This hardy plant ripens its grains in many climates and makes itself at home in many soils. Few crops are treated in such widely different ways. On the best American farms corn is usually given a rich, mellow seed bed. It is cultivated by excellent machines, gathered by a costly harvester, and ground by a well-equipped mill. In parts of Africa the seeds are still dropped into holes made by a sharpened stick. The plant is still cultivated by wooden plows, the ears carried to the storehouse in baskets, and the grain beaten into food with a stone.

The amount of corn grown in the United States is enormous. To state that our country grows yearly over 3,000,000,000 bushels of corn gives no clear

idea of the greatness of the amount. Our minds cannot without aid form a picture of so many bushels. But suppose our nation should undertake to haul these bushels in two-horse wagons. If the drivers put 40 bushels in each wagon, the train of wagons would stretch out in an unbroken line for 426,000 miles. One hundred and fifty million horses would be needed to draw the wagons. This is about seven and a half times as many horses and mules as we have in the United States. Suppose that each team could be given wings and could fly through the 240,000 miles between the earth and the moon. When the last wagon of the long train left the earth, the first wagon would be three fourths of the way back to the starting point. If these wagons were piled one on the other, they would make a tower over 71,000 miles in height.

FIG. 1. OUR GREATEST CEREAL

Big as this crop is, however, modern thrift provides ways to use not only these millions of bushels of grain, but also every part of the stalk which bears the grain. Of course the greatest use of corn is to feed man and his domestic animals. Everyone is familiar with the many forms in which ground corn is served on our tables. Nearly everyone has occasion to see how greedily animals eat both grain and stalk. Many do not know, however, that corn is widely used in the arts. At present 50,000,000 bushels of corn are manufactured into starch, sirups, and sugar every year. The United States sends annually to foreign countries 83,000,000 bushels of corn. With the rapid growth in the use of starch and of corn sirups and sugars our country will probably soon consume as much corn in making these products as it sells to outside countries.

A study of Fig. 20 will help us to remember some of the more recent uses of the corn kernel. The germ is found at the bottom of the kernel. The central portion of the kernel is called by the long name "endosperm." The outside of the kernel is, as you all know, called the hull. Corn oil and oil cake are made from the germ. Corn oil is used in making soap, soap powders, oilcloth, paints, varnishes, and a kind of rubber for overshoes, automobile tires, and other kindred products. When the oil is purified it is used in place of lard in bread, cakes, salads, and liniments. The oil cake is a stock food.

From the endosperm immense quantities of starch are made. Starch and two of its products — corn sirup and dextrin — are used in so many ways that even to name them would be tiresome. They enter into such foods as jellies, sauces, puddings, pie fillings, candies, mincemeats, preserves, and canned meats. They go into pastes, gums, mucilages, inks, blacking, shoe polish, and hair tonics. They are useful in tanning leather, thickening colors for calico, filling cloth, and in paper manufacture. They find a place in the making of mirrors, tires, chewing-tobacco, face powders, laundry supplies, and vinegars. Corn husks are made into hats, doormats, and a fine quality of bank-note paper; they also furnish packing for horse collars, furniture, and coarse mattresses. Paper is made from the blades and stalks. The cobs go to market in the shape of corncob pipes. Even the pith is seized by careful fingers and made into box-board, guncotton, and a packing for armored ships that may be pierced by shells.

To aid in seeing how important this widely used plant is to the American farmer, let us study a map prepared by the United States Department of Agriculture.

What do you find stated in the right corner of the map to be the total yield of corn in the United States? Taking the population of our country as one hundred and ten million people, how many bushels would come to each man, woman, and child

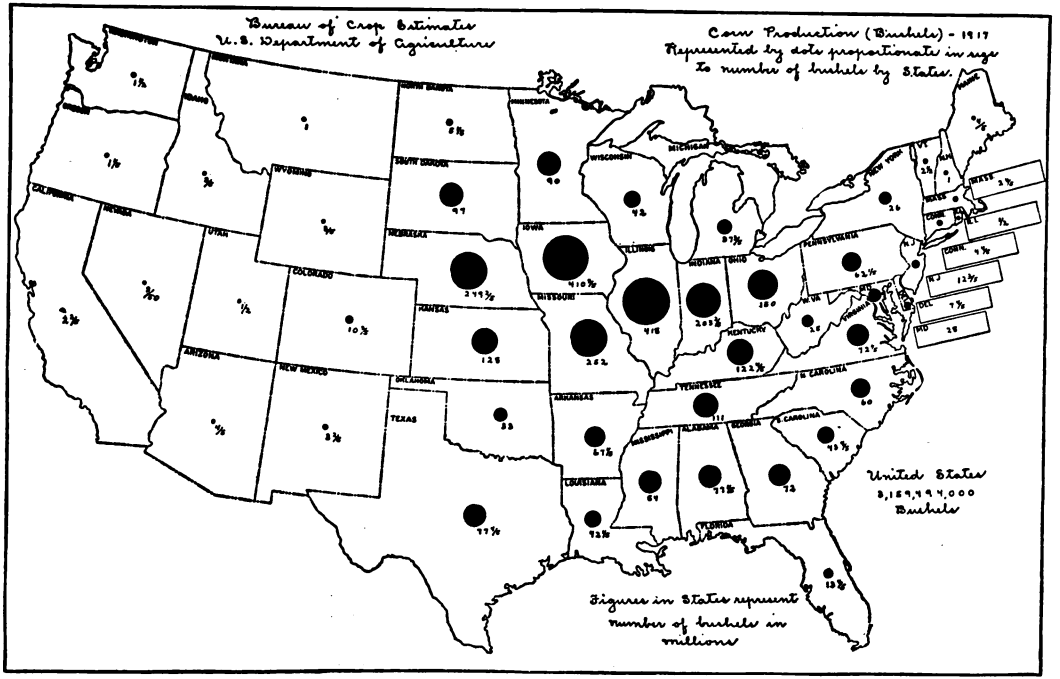


FIG 2. MAP TO SHOW CORN PRODUCTION BY STATES

if the entire crop were divided among them? The average price of corn in America for the year in which this map was made was about $1.28 a bushel. Take the figures showing the total yield and see what was the money value of the crop for that year. If you should divide this crop among the

FIG. 3. SHERMAN HALL AND HIS YIELD OF 107.33 BUSHELS

twenty-five million school children in America, how much money would you receive? What do you learn from the dark circles within the state bounds? Which state has the largest circle? How does this large state circle compare with the circle in your state? In 1915 the United States produced about three fourths of the world's supply of corn. Name from the map the ten states that grew most of this

corn. Would anyone be right in calling these states the Corn Belt? Can you find out whether some of these states are also in the Cotton Belt?

As you perhaps know, corn grows best in sections that have comparatively warm, moist, fertile soils and that also have comparatively long growing-seasons. Will these facts or any one of them explain why there are no large circles in the New England States? Is it for the same reasons that the map shows no large circles in the states west of Kansas and Nebraska?

The average yield of corn in the United States is about twenty-six bushels to the acre. In many states the boys taught in the corn clubs have doubled this yield. Suppose we could by following the methods taught in this book double the total yield of the United States, how much would this add to the wealth of our country? How much would it add to the value of your corn crop? Would doubling the yield double the cost of growing the crop? In answering this question, think about these other questions: Would there be any added cost for rent? Would the labor cost any more? Would the fertilizer be more costly? Would it take more seed? Would more tools be needed? Would the crop be harder to harvest? Should you not, then, as a wise young grower be willing to study constantly and carefully these methods, and use them on your own farm?

POINTS FOR THOUGHT

1. Name some articles in your home in which corn products are used.

2. Remembering that the United States raises three fourths of all the corn grown in the world, draw a circle to show the size of the world crop.

3. Soak a grain of corn in water, then split it and see whether you can separate the germ, the endosperm, and the hull. Note the difference in color between the germ and the endosperm. Does the oil in the germ cause this difference in color?

4. Allowing forty bushels to the wagon, how many wagons would it take to haul at one time the total crop of your state? How many horses would be needed to draw these wagons? If a horse is nine feet long, how long would the line of horses be?

5. Measure your home crib or any other crib and, allowing two and one-half cubic feet of corn in the ear to one bushel of shelled corn, see how many bushels the crib will hold.

CHAPTER II

THE BEGINNING OF THE CORN CROP

Most of our greatest crops were grown in the older countries centuries before America was discovered. Wheat and oats seem to have had their first homes in central Asia. Sugar cane was brought from India. Cotton, although it is now so largely an American crop, was, like sugar cane, perhaps first grown in India. As Americans, however, we are proud that corn, our greatest crop, is a native of our own country. It was unknown to the Old World before Columbus made his remarkable trip.

Perhaps some pupil is ready to ask: "Is that not a mistake? We read in the first book in the Bible, 'And Joseph gathered corn as the sand of the sea,' and of course the Bible was written long before the time of Columbus." In early writings, however, the name "corn" is usually given to the greatest grain crop. When this word, then, is used in the Bible, wheat, not Indian corn, is meant.

All the explorers of America were struck by the beautiful new grain plant found on our shores. Columbus writes King Ferdinand and Queen Isabella, "On one of the islands I found fields eighteen miles long growing in maize (corn)." Cartier was one of

the first to sail into the cold waters of Canada. He says that he found a great town (now known as Montreal) situated in a cornfield. John Smith, hero of the colony of Jamestown, calls attention to the usefulness of Indian corn. The Puritans mention corn in New England and say that the Indians used fish as a fertilizer for corn.

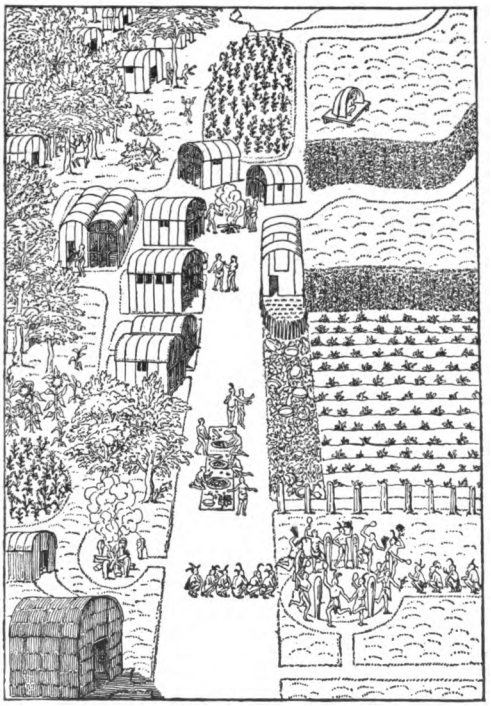


FIG. 4. FIRST PICTURE OF INDIAN CORN
(After John White)

Early visitors to America expected to find many wonders like fountains of youth and caves of jewels. Although they did not find the expected wonders, they told some things almost as surprising. One of these writers says of corn:

> Heer [here] of one graine of maize a reed doth spring.
> That thrice a year five hundred graines doth bring.

In 1585 Sir Walter Raleigh attempted the first English settlement in America. This colony started cabin homes on Roanoke Island, North Carolina. Among the daring men who came with this colony were Thomas Hariot, a writer, and John White,

FIG. 5. INDIAN COOKING CORN. (After John White)

an artist. Hariot wrote, in what now seems to us queer spelling, the first article ever written about Indian corn. He thus describes the new plant:

Pagatour, a kind of graine so called by the Indians; the same in the West Indies is called Mayse; Englishmen called it Guinney Wheate or Turkey Wheate according to the names of the countreys from whence the like hath

beene brought. The graine is about the size of an ordinary English peaze, not much different in forme and shape, but of divers colors: some white, some red, some yellow, and some blew. All of them yeelde a very white sweete flower; being used according to his kinde it maketh a very goode bread. . . .

It is a grain of marveilous greate increase; of a thousand, fifteene hundred and some two thousand fold. There are three sortes of which two are ripe in eleven or twelve weeks at the most; sometimes in ten after they set, and are then in height of stalke about six or seven foote. The other sorte is ripe in fourteene, and is almost ten foote high; of the stalks some beare four heads, some three, some one and two; every head containeth five, sixe or seven hundred graines within a fewe more or less. Of these graines besides breade the Indians made victaull either by parching them or seetheing them whole until they be broken, or by boyling the floure with watter into a pappe.

Our corn-club boys will even now find it hard to equal the yield of corn as given by Hariot. He says, "An English Acre doth there yield in croppe of corn, beanes and peaze at the least two hundred London bushells."

Not only did this colony furnish the first historical account of our great crop but also the earliest drawings of the natives. John White, the artist, drew many striking pictures to show how the Indians looked and how they lived. Among these drawings were two showing the ways in which the Indians cooked their corn. One of these is copied in this

book; these drawings were the first Indian-corn pictures ever looked on by English eyes.

If it had not been for corn, America could probably not have been settled when it was. You remember what a trying time the early settlers had. They were three thousand miles from supplies. Their ships took three months to cross the ocean. Sometimes ships trying to reach them with food and clothes were driven back by storms. Often for weeks and months "they cast longing eyes to the east" to see whether help were coming. In this "starving time," as it was afterwards called, the poor sufferers lived largely on food made from corn. Their Indian neighbors taught the men how to grow the crop. The squaws showed the women how to crush the grain in wooden or stone mortars and how to make different palatable dishes from the grains. In the absence of grass crops the animals of the settlers were largely supported by the corn plant. Three years after Jamestown was founded the colonists were cultivating thirty acres in corn. One of the

FIG. 6. INDIAN MORTAR FOR CRUSHING CORN

Pilgrim writers of New England tells how they fertilized their fields of corn with fish. He says:

According to the manner of the Indians we manured our ground with herring, or rather shad, which we have in great

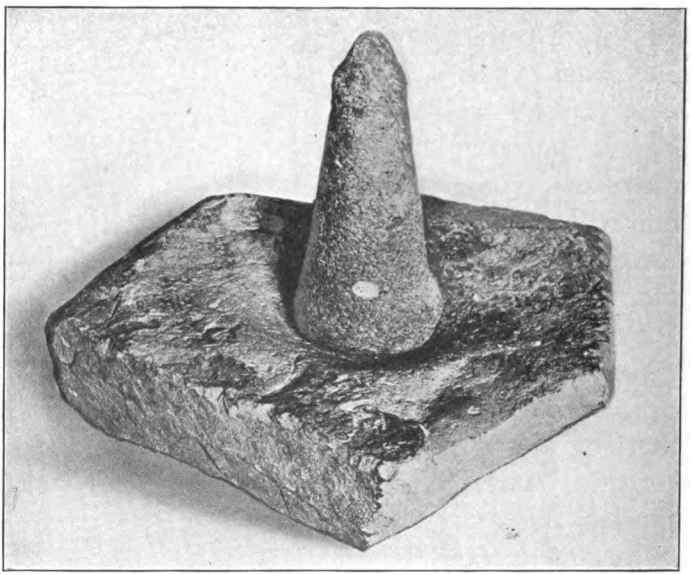


FIG. 7. INDIAN STONE MORTAR FOR CRUSHING CORN

abundance, and take with ease at our doors. You may see in one township a hundred acres together set with these fish, every acre taking a thousand of them, and an acre thus dressed will produce and yield as much corn as three acres without fish.

As the number of people in America grew larger the growing of corn increased rapidly. At an early

date barrels of corn began to go in large quantities to the Old World. The countries around the Mediterranean Sea were suited to the new grain crop, and it gradually spread over large sections of Europe,

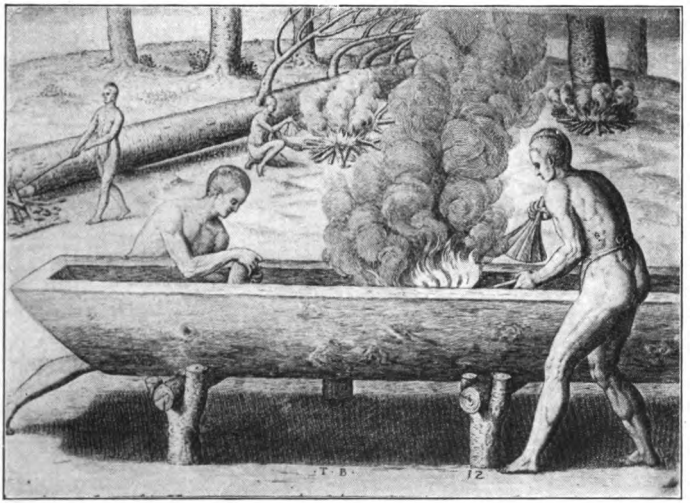


FIG. 8. INDIANS CLEARING LAND BY FIRE FOR CORN
(After John White)

Asia, and Africa. The Portuguese were great sea-goers in that day, and they took corn into their colonies.

POINTS FOR THOUGHT

1. Try to find from your histories what crops, besides corn, America gave to the world.

2. Our modern fertilizers are bought to supply three plant foods. Which of these does for our corn what the fish did for the Indian's corn? Do we now use fish in any form as a fertilizer?

What does the fact that the Indians had to use fish show about their lands? Does your land suffer from the same lack?

3. Study the picture (Fig. 8) to see how Indians cleared their lands of trees. Would this slow and troublesome way of getting rid of trees explain the need of fish?

4. The Indians used one thousand herring to the acre. If each herring weighed half a pound and contained 8 per cent of nitrogen, how much nitrogen did the Indians use to the acre? How does this compare with what our farmers use?

5. From a comparison of the pictures in this chapter write a paragraph on "The Indian Way of growing and cooking Corn."

6. What per cent of your own farm is planted in corn?

CHAPTER III

CLIMATE AND THE CORN CROP

Each plant has, of course, a home where it first grew. If a plant is valuable for its body, its fruit, its flower, or any other part, man will sooner or later take it into every country in which it will grow. The more valuable the plant, the wider it will be scattered.

Students of the corn plant think that its first home was in warm table-lands high above the sea level, — perhaps as high as four or five thousand feet. There it proved so hardy and useful that men who are always hunting new foods learned its value and wanted to plant it wherever they settled. Hence, in the course of time, it became, as we have seen, one of the most widely grown of farm crops.

In spite of its wide growth corn is still very sensitive to climatic conditions and refuses to yield its highly prized grains except in climates like that from which it came or to which it has adapted itself.

Suppose you wanted to buy a farm on which to grow corn. Would it not be well to know in which climates to buy? First, is it necessary for corn to have the same height above the sea level as it had in its first home? If corn will grow on lands lower

or higher than 4000 feet, will this not prove that the same height is not needed? In India it fruits at a height of 7000 feet above the sea, in Peru at 8000 feet, and in Mexico at 10,000 feet. At the same time it makes a good crop in North Carolina at sea level. Would you, therefore, in choosing a farm have to think much about height? Could you safely buy anywhere in Ohio, in Tennessee, in Kansas, or in Vermont?

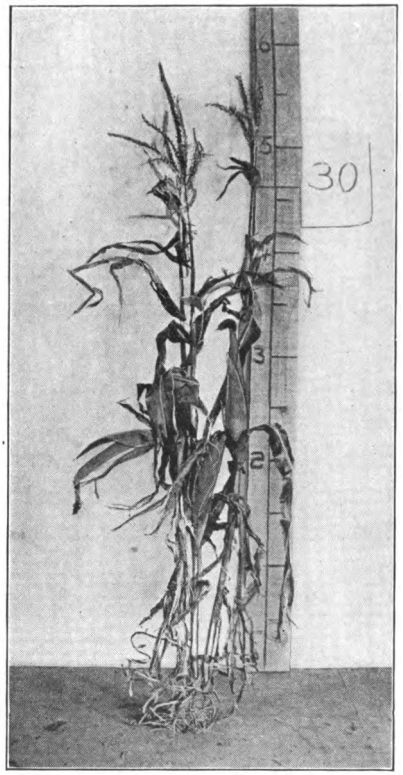


FIG. 9. CORN GROWN IN HIGHLANDS OF MONTANA

In selecting your farm you will, so far as height goes, have to keep in mind one other fact. In the Middle States corn that will ripen in one hundred days at a height of 1000 feet will need one hundred and thirty or one hundred and forty days at a height of 2000 feet. If you want to grow early corn, would you buy at a height

above 1000 feet? Do not forget that great height means cool nights, and such nights require a longer growing-season. The different kinds of corn take from ninety to about one hundred and eighty days to ripen. If you bought a highland farm, would you have to plant slow or rapid ripening kinds?

FIG. 10. IOWA FIELD WITH ABUNDANT MOISTURE

Corn, like all bulky crops, must have abundant moisture. It takes from eighteen to twenty tons of water to make one bushel of corn. Fig. 10 shows an Iowa cornfield, and Fig. 11 a Georgia cornfield. Let us see how much moisture is needed to make good crops such as are shown in these pictures. The average rainfall during May, June, July, and August, in Iowa, through a period of eighteen years, was four

and one-half inches. In Georgia it was four and seven-tenths inches. Both of these fields received, whether or not the average amount fell on them, enough water to meet their needs. Now glance at Fig. 12. This picture shows the size of corn grown in a section of Arizona. The average rainfall where this

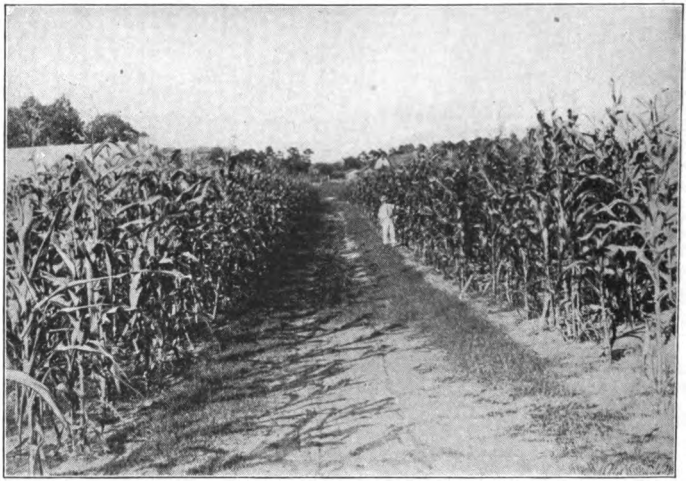


FIG. 11. GEORGIA FIELD WHERE MOISTURE WAS AMPLE

corn was grown was, for the same months, only about nine tenths of an inch. Do you wonder at its small size? In buying a corn farm would you not ask about the average rainfall during the growing-season? Would you buy even a farm at a low price if the average monthly rain in summer was below four inches? If you wanted to buy in Arizona, would you not buy close to an irrigation ditch?

Even in the Corn Belt there is a close connection between the amount of rainfall and the yield of corn. In 1891 the average rainfall in Iowa (one of the largest corn-growing states) for the four growing-months was 4.3 inches. The state averaged for that year thirty-eight bushels of corn to the acre. In

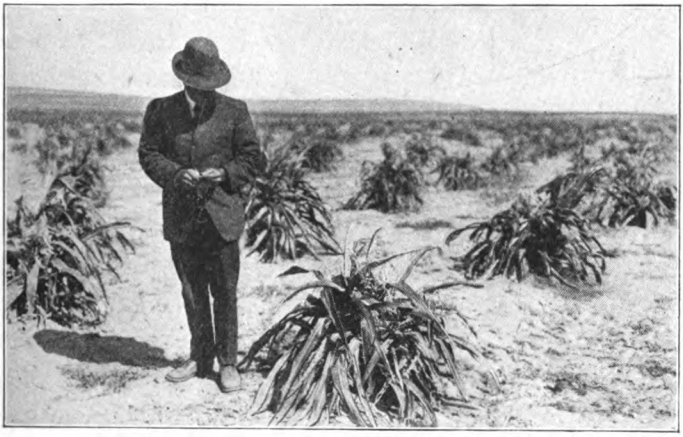


FIG. 12. CORN IN DRY LANDS OF ARIZONA

1894, a very dry year, the average rainfall in the same state for the same months was only 1.7 inches, and the average yield to the acre was only fourteen bushels. For lack of the usual rain the yield fell off nearly three fourths. If this happened in a good corn state like Iowa, could you risk buying a farm in any section where the annual rainfall was low?

Not only must corn have enough rain but it does best in climates where the rainfall during the period

of its growth is fairly well distributed. An ideal season is one in which three or four inches of rain fall during both May and June, and a little more in July and August when the plants are tasseling and silking and the grains are filling. Let us take another illustration from Iowa. In 1900 that state averaged forty-three bushels to an acre. This was the largest average yield in eighteen years. It will be interesting to note how the rain was distributed during the four growing-months of that year. In May, 3.3 inches fell; in June, 4 inches; in July, 6.2 inches; in August, 4.7 inches.

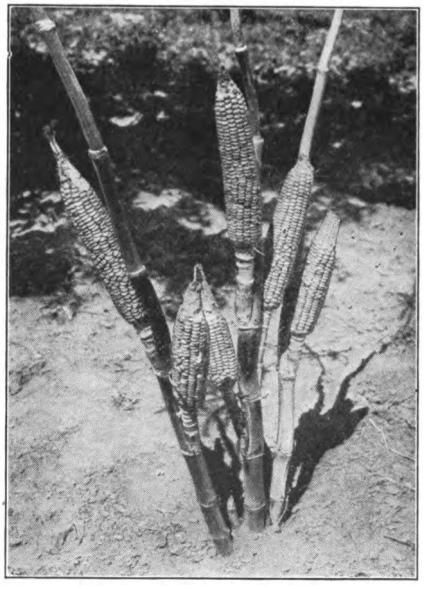


FIG. 13. NAVAJO CORN IN DRY LANDS OF NEW MEXICO

Now compare this with the very next year's yield. In 1901 the average for the same state was only twenty-six bushels. How was the rainfall distributed in this year? In May the rainfall was 2.3 inches; in June, 3.7 inches; in July, 2.3 inches; in August, 1.3 inches. You will notice that in this year the rainfall

for the two months most important in the growth of the crop was far smaller than in the other year.

On the other hand, during tasseling and silking time, heavy rains (especially heavy, blowing rains), are very harmful to the crop. Such rains at this time not only wash the pollen away, so that it does not fall on the silks, but they prevent a proper growth of the roots. Therefore, in buying a corn farm should you not take time to study not only the average rainfall during the growing-season but also how this rainfall is distributed?

Perhaps some of you have read that corn is grown in South Africa and that the rainfall there in our summer months is comparatively small. You are, therefore, ready to ask how corn can be grown in that country. Turn to your geographies and you will find that the months for growing corn there are December, January, and February. In these months there is enough rain to grow the crop.

Now will you not turn to the graphic map on page 5 and let us think over another climatic effect. Notice on the map that beginning in the south and going north the circles grow larger until a line north of Nebraska, Iowa, and Illinois is reached. Then the dark circles again grow smaller. These circles, of course, show that the corn crop is largely raised in seven states; namely, Illinois, Iowa, Nebraska, Missouri, Kansas, Indiana, and Ohio. The average summer temperature of these states is

between seventy and eighty degrees; they also have in summer comparatively few cloudy days. Would not these facts lead you to think that it would be well for you to buy your farm in a climate having about this same amount of heat and sunshine?

FIG. 14. THRIVING CORN IN THE SOUTH

But suppose for family or other reasons you want to buy a corn farm south or north of the Corn Belt. You will then wish an answer to these questions: Could the states lying south of the Corn Belt become great corn-growers? Could the states lying north of this belt be made to yield heavy crops of corn?

FIG. 15. CORBETT ALEXANDER AND HIS YIELD OF 155 BUSHELS

In the South there is no reason why the corn yield on any well-tilled farm should not be large. In fact, the largest number of bushels produced so far on a single acre of an American farm was produced in South Carolina. Many heavy yields have been made in all the Southern states. Why, then, if such yields can be made below the Corn Belt, is not more corn grown in that section?

There are two main reasons: First, in the Corn Belt few crops can be grown year in and year out that pay so handsomely as corn. This is not true in the South; while corn grows admirably, other crops like cotton, tobacco, sugar cane, peanuts, soy beans, and sweet potatoes bring the farmer, as a rule, more money than corn does. Moreover, having a climate suited to so many crops, the Southern farmer naturally wishes to grow a variety of crops so that if one fails or is low in price another may supply his needs. Hence, instead of planting their lands mainly to corn as the farmers in the Corn Belt do, the planters in these Southern states grow many kinds of crops. The second reason is this: owing to long summers the humus in Southern soils is used up during the year more rapidly than is the humus in the soils of the Corn Belt. If a plentiful supply of humus is kept in Southern soils, you need not fear to buy a corn farm anywhere from Virginia to Texas.

Now to answer the second question, namely, Could the states north of the Corn Belt be made to yield

heavy crops of corn regularly? In these states there is some of the richest land in the world. The rainfall is plenteous and the height above the sea level is not too great. But, for all these climatic blessings, these states can never become huge growers of corn. Why not? The growing-season is too short.

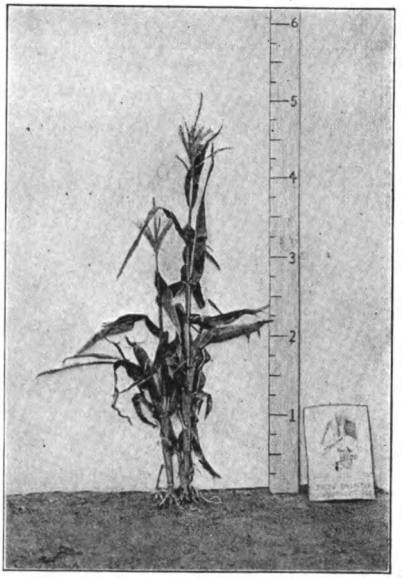


FIG. 16. THIS MONTANA CORN HAD ONLY ONE HUNDRED AND SEVENTEEN GROWING-DAYS

You will understand this better if you compare the growing-season of a state in the Corn Belt with that of a state north of it. Let us count the growing-season as the time between the average date of planting and the average date of harvesting. In Illinois, the largest corn-producing state at present, there are one hundred and sixty-nine growing-days. In Texas, of the Southern Belt, there are two hundred and seven growing-days. Now selecting North Dakota or Maine, of the Northern Belt, we find that both of these states have only one hundred and seventeen

growing-days. In other words, the growing-seasons in North Dakota and in Maine are fifty-two days shorter than the growing-season of Illinois and ninety days shorter than the ripening-time of Texas. Now the most productive kinds of field corn take

FIG. 17. FIELD WHERE CONDITIONS WERE FAVORABLE

about one hundred days to ripen. You see, then, that in Illinois the crop has sixty-nine days in which to make itself safe from early frost or cold, while in North Dakota or Maine it has only seventeen days. Hence, in all these colder states the corn crop is necessarily a more or less uncertain one. In the Corn Belt there are almost no late spring frosts or early fall frosts.

Now you know how corn is injured by a very little cold. Indeed, the length of its growing-season is, as has been said, "measured by the last spring frost and the first one of autumn." One light frost in the fall at once stops its growth. No state, then, that does not have at least five months of freedom from frost can ever become a really great corn state. With your heart set on growing corn, would you dare select a farm in these colder states?

Taking all these climatic facts into consideration in your choice of a farm, are you not ready to say, "I will, other things being equal, most safely buy my farm in a section with these climatic features: first, where the height above the sea level is not too great; second, where the rainfall averages at least four inches each month of the growing-season; third, where the rain in the growing-season is fairly distributed; fourth, where there is an abundant amount of sunshine and not too many cloudy days; fifth, where there are at least one hundred and fifty days of warmth and freedom from frost."

POINTS FOR THOUGHT

1. If a field of corn yielded one hundred bushels, how many tons of water did the plants need to make this yield?

2. Explain what climatic reasons keep the states on the Pacific slope from being great corn states.

3. Why would a field of corn in Minnesota be expected to finish its growth in a shorter time than a field in Louisiana?

4. In case a friend told you that his prize acre of corn received only two inches of rain in July and one and one-half inches in August, would you think that his acre was likely to win the prize?

5. Explain why the Southern states are not heavier growers of corn. Do the same reasons keep the extreme Northern states from raising corn in large quantities?

CHAPTER IV

RACES OF CORN

The human family — alike in so many ways — is divided into races; namely, white, yellow, red, brown, and black. This division is, of course, made from the color of the five races. So, in like manner, corn plants are divided into races, but the division is not on account of color.

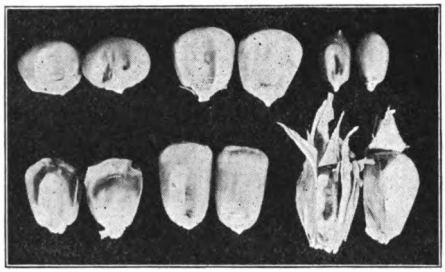


FIG. 18. FRONT AND BACK OF KERNELS OF DIFFERENT RACES

Top row (left to right): flint, soft, pop. Bottom row (left to right): sweet, dent, pod

Let us learn to divide corn into races. To do this we shall have to study a kernel closely and learn some new names. The kernels of each race differ. In Fig. 18 we see the front and back of a kernel from each of the principal races. Do you notice the sink in the first kernel of each pair? Is there such a sink in the back of the kernels? Did you ever think what this sink is for? The young plant which is to grow from each of these grains is cuddled in this sink.

If you soak one of these kernels and then split it with a sharp knife, you will see, if your eyes are sharp, what is shown in Fig. 19. In the middle of the kernel the young plant called the germ, chit, or embryo is shown. This germ, or embryo, reaches from *A* to *B*. Do you notice that the germ has a root (*C*) and a shoot, or stem (*D*)? Just below the germ you see the tip cap marked. This fastens the kernel to the cob and protects the lower end of the germ. Its wedge shape enables it to sink into the cob and hold the kernel in place. All around the germ, as shown in Fig. 20, are the starchy parts of the kernel. The starch on each side of the germ is harder and darker than the starch at the top of the kernel. Hence it is called the horny starch, while the whiter and softer starch at the top is known as crown starch. The young plant feeds on these starchy parts of the kernel until it is strong enough to draw its food from the soil. Both the young germ

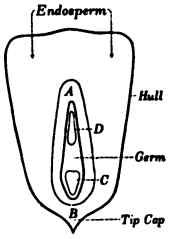


FIG. 19. A SPLIT KERNEL

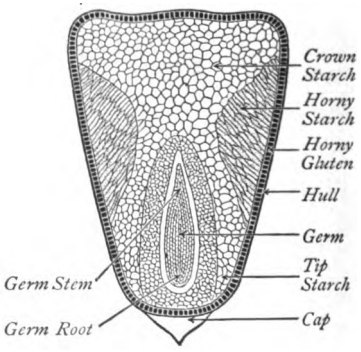
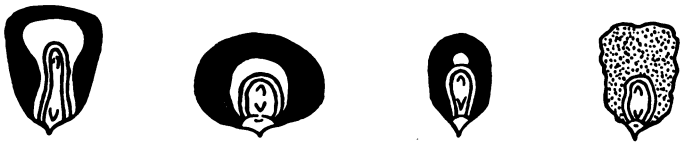


FIG. 20. HOW STARCH IS DISTRIBUTED IN THE KERNEL

and its starchy food are very tender. To protect them nature has sealed them in a thin wafer-like layer, which goes entirely around the kernel. This covering just inside the hull is called the horny gluten. All the starchy parts, both horny and white, which are shut in between the horny gluten and the germ, or embryo, are called by the long name "endosperm." You will need to remember this long word, which means just the part around the seed or germ of every race or variety of corn.



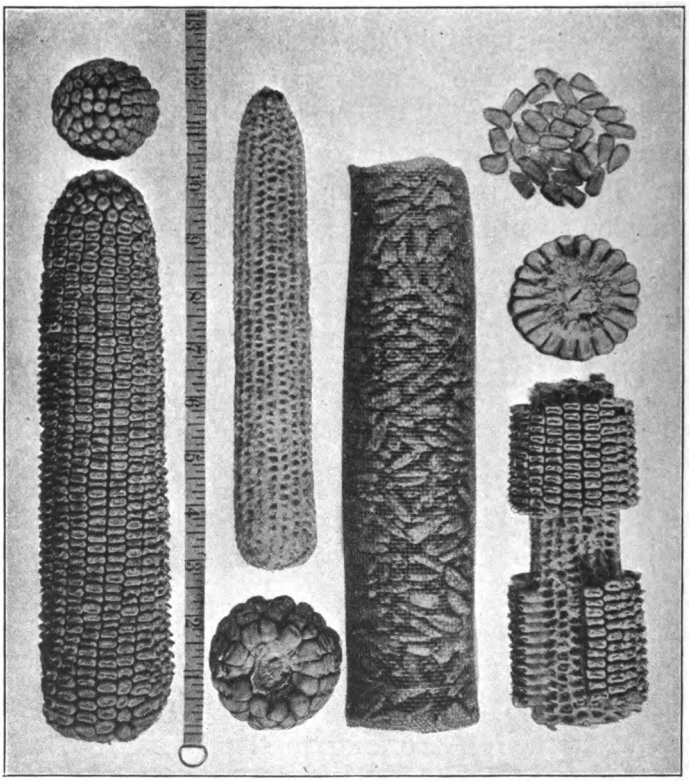
A. Dent *B.* Flint *C.* Pop *D.* Sweet

FIG. 21. ENDOSPERM OF FOUR PRINCIPAL RACES

Now the endosperms of corns differ somewhat. Corns that have endosperms alike are put into one race, just as men who are colored alike are put into one race. Hence, to tell to what race a corn plant belongs we shall have to examine the endosperm of the kernel. According to the likeness of their endosperms corns are divided into the following races: dent, flint, pop, sweet, soft, and pod.

Dent corn. By comparing the split kernels in Fig. 21 we shall see how the endosperms differ, and hence learn how the different races are classified. Find the hard or horny starch in kernel *A*. Is it in the sides of the embryo, or germ,

or is it in the top, or crown, of the kernel? What fills the entire top of the kernel? One whole race of corn has its

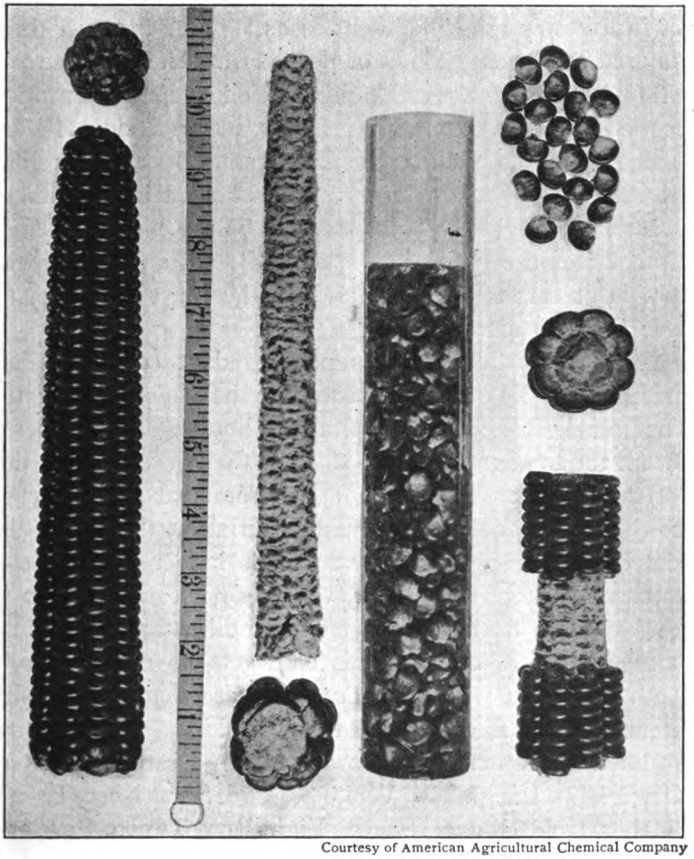


Courtesy of American Agricultural Chemical Company

FIG. 22. DENT CORN SHOWING ALL PARTS OF EAR

starchy parts, or its endosperm, arranged in this way. Do not forget that these starches, both horny and soft (or crown), are held between the harder back and front of the kernel just as butter is held between two hard crackers. Now as

the kernel hardens in ripening, it loses moisture and shrinks. The softer starchy parts between the flat front and back of



Courtesy of American Agricultural Chemical Company

FIG. 23. FLINT CORN SHOWING ALL PARTS OF EAR

the kernel shrink more than the harder front and back. This inside shrinking leaves a slight trough, or dent, at

the top of the kernel between the front and the back. This dent occurs only at the top because nearly all the soft starch that shrinks most is at the top. All kinds of corns that act in this way are called dent corns. There are over three hundred and twenty kinds of dent corn. Among these you will find such favorites as Leaming's Yellow, Riley's Favorite, Boone County White, Iowa Silver Mine, Reid's Yellow Dent, Hildreth's Yellow, Cocke's Prolific, Mosby's Prolific, Horsetooth, Sanders's Improved, Hickory King, Southern Beauty, and Weekley's Improved. These kinds differ in the color of the grain, in the size of stalk and ear, in the number of ears to the stalk, and in other ways; but they all have the endosperm alike.

Flint corn. This race is next to dent corn in value. Examine the figure (p. 33) showing the endosperm of the flint kernel. Where do you find the horny starch? Does it not fill the top as well as the sides of the kernel? Does this not make the endosperm different from that of the dent? As the flint kernel ripens could it shrink at the top as the dent does? Since the horny starch is harder than the soft starch at the top of the dent, will this not cause the top of the kernel to be harder or more flintlike than the dent? Does this fact show how this corn gets its name?

As is the case with dent corn, there are a great many different kinds of flint corn. Among the kinds, or types, that are liked by farmers who grow flint corn are the following: King Philip, Longfellow, White Sanford, Smut Nose, Bloody Butcher, Gold Nugget, Squaw, Eight-Row, Twelve-Row, and Angel of Midnight.

Sweet corn. Let us turn again to Fig. 21. In the drawing of the sweet-corn kernel look carefully for any hard or horny starch which would be shown, as in the dent and flint kernels,

by darkened areas. Does this not show that sweet corn has no hard or horny starch in its endosperm as the dents and flints have? In all the sweet corns the starch of the endosperm has been largely changed to sugar; hence the kernel shrinks evenly as it ripens. This gives to each kernel the wrinkled or shriveled look that marks this kind of corn. All sweet corn has a wax-like appearance. The generous amount of sugar makes it a favorite table corn. There are at least fifty different kinds or varieties of sweet corn. Among the most widely grown are the following: Country Gentleman, Stowell's Evergreen, White Cory, Marblehead, Golden Bantam, Early Landreth, Crosby's Early, Squantum, Stabler Early, Chicago Market, Black Mexican, and Ne Plus Ultra.

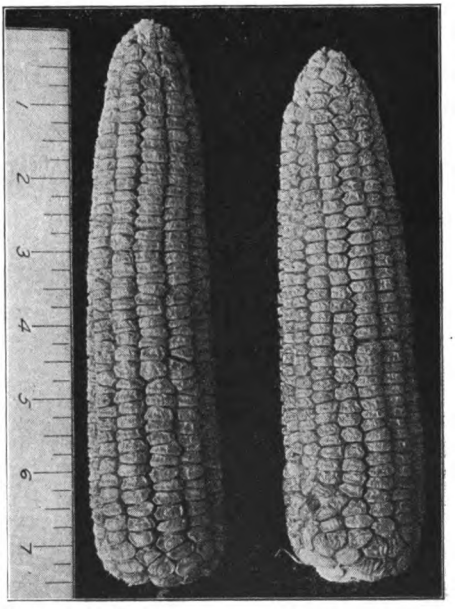


FIG. 24. SWEET CORN

Pop corn. This is the dwarf among the regular corns. It is small in stalk, kernel, germ, and ear. In looking at the pop-corn kernel in Fig. 21, do you see much soft starch in the endosperm? The dark shading tells you, does it not, that almost the whole endosperm is made up of flinty, or hard,

starch? In the hardness of the endosperm is found the reason why this is the only kind of corn that "pops" when it is heated. The flint kernel is harder than the dent kernel but not so hard as the pop-corn kernel. If a flint kernel is heated it will not burst and turn inside out as the pop corn does; it will only crack. What makes the difference?

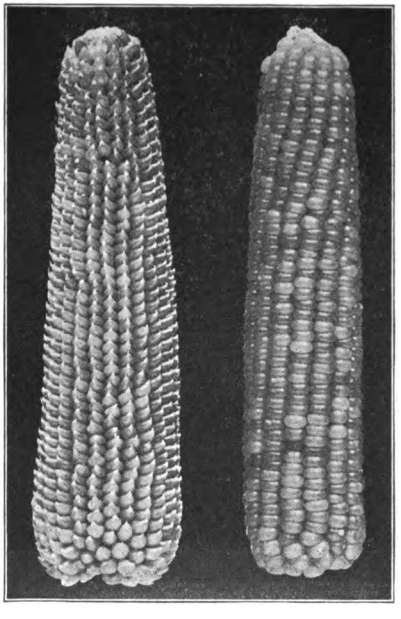


FIG. 25. POP CORN (RICE AND PEARL)

The popping is perhaps due to the fact that water boils at 212° F. If a weight is put on the vessel holding the water, the water will not boil until a much higher degree of heat is reached. Should you take the pressure off the water after the heat has passed considerably beyond 212° F., the water will flash into steam and expand violently. This is what happens in popping corn. Moisture is shut up in the kernel and held in by the hard endosperm. When you heat the kernel in your popper its hard endosperm acts just like the weight on the water. By and by, as the heat increases, the moisture is changed into steam, violently bursts the kernel, and turns the starch inside out. It becomes about twenty times its natural size when it is popped. A pint and a half of kernels will make almost a half bushel of popped corn.

Pop corn is divided into two kinds: namely, the pearl and the rice. Of these the rice is the more important. In the rice variety the ears taper rapidly to the tip and the kernels are sharp at the crown. The best varieties of the rice kind are White Rice, Snowball, Old Homestead, and Monarch. The pearl varieties do not taper so much, and the kernels are round at the top. Among the pearl kind, White Pearl, Queen Golden, and Eight-Rowed are favorites.

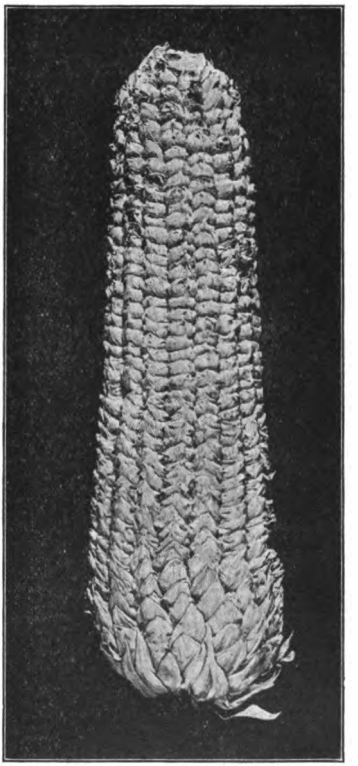


FIG. 26. POD CORN

There are two other races of corn, known as the pod and the soft. As these two kinds have little market value, however, we shall pass them by.

From a study of the split kernels we have found how the races of corn are grouped. Let us now examine the entire kernels and also the ears, so that we may know the races by sight. In Fig. 18 you are given a front and a back view of a kernel from each race. See how keenly you can point out differences between these kernels. Which race has the largest

kernel? Which the smallest? Which has the most wedge-shaped kernel? Which the most wrinkled? Which seems to have the largest germ? Which is most nearly round? Which can stick in the cob best? Try to get kernels of each of the four most

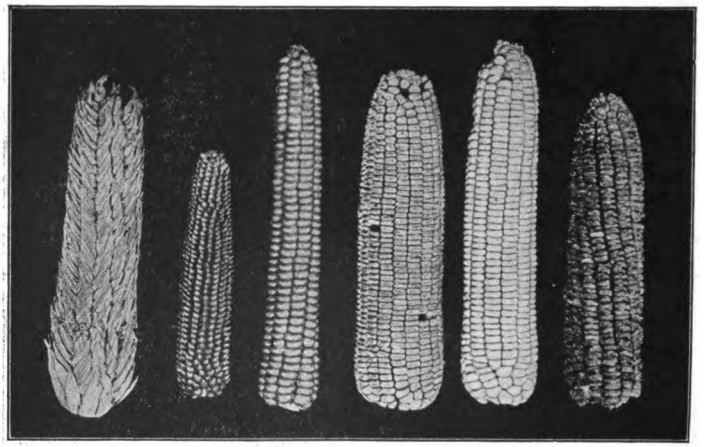


FIG. 27. EARS OF DIFFERENT RACES GROUPED FOR COMPARISON

useful races and examine them until you know one from the other. Notice also the color of each and the difference in hardness.

In the same way compare the ears shown in Fig. 27. Examine the size and the shape of each ear. Which seems to have the most rows? In which are the rows most nearly straight? Which has the least space between the rows? Which has the widest space? Which has its rows very crooked? Which is most wrinkled? Which would you think

has the largest number of kernels? If possible, get an ear of each race and do not lay the ears aside until you can easily state to which race each belongs. Compare the difference in color. Note the smoothness of the flint and the wrinkled look of the sweet. Count the kernels in each row and find out how many kernels there are in each ear. Note whether the number of rows is always an even number. Shell the kernels and note the size of the cobs. Be sure to see whether any of the smaller ears have cobs that look very large for the size of the ear.

In addition to knowing these four races by sight are there any other facts about them that you, as a corn-grower, ought to know? Should you not know which yields the most heavily? Which will suit your soil and climate best? Which will fit in best with your farm needs and with your markets?

Nine tenths of the corn grown in America is dent corn. This means, of course, that of all the barrels of corn hauled by our railroads or used in our homes nine barrels out of every ten are filled with dent corn; one barrel only of the ten is flint, sweet, or pop corn. For every barrel of pop corn grown in our country there are raised, roughly speaking, two barrels of sweet, seven barrels of flint, and ninety barrels of dent corn. Would this fact not lead you to think that dent is the most valuable corn for our American growers?

What makes dent corn such a favorite? Its stalk and leaf are larger than the stalk and leaves of other races, hence it makes more forage. Its ears are larger, hence it makes a large yield. As a result of tests for three years at the Pennsylvania Experiment Station it was found that the dent corn nearly doubled the yield of the flint corn. The dent husks do not cling to the ear so closely as the flint husks do, hence the dents are more easily husked. The kernels of the dent are softer than those of the flint corn, hence animals can more easily chew the grains. As a rule, however, dent corns need a longer growing-season than the other kinds do. Therefore they will not suit cold climates, where the growing-seasons are short.

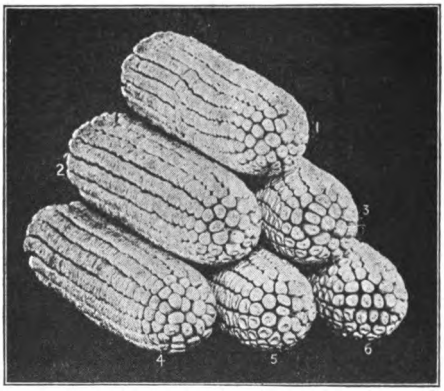


FIG. 28. HIGHLY BRED DENT EARS

With all these qualities in its favor, why does not dent corn take the place of flint corn on our farms? It is because flint corn is finely suited to cool climates on account of its ripening earlier than dent corn. If you look out of a train window and see large fields of flint corn, you may be sure that you

are in a cool climate. This race is very useful for forage, as it produces many suckers and its leaves and stalks are not as woody as those of the dent. The hardness of the flint kernels makes this kind of corn excellent for long sea voyages. It owes this excellence to two qualities: first, after its kernels once dry out, they do not readily take up enough moisture to spoil; second, the hardness keeps insects from injuring the kernels.

There has been a remarkable increase from year to year in the amount of corn canned. This, added to a growing fondness for fresh sweet corn for our tables, has caused a great increase in the planting of sweet corns. Canners use this kind of corn almost entirely because its kernels are so rich in sugar. By carefully selecting suitable seed, sweet corn may be grown in almost any climate in which other corns will grow. As this kind of corn suckers freely, it is valuable for forage.

Since the invention of movable machines for popping the kernels of pop corn, and since merchants and street sellers have found a ready sale for the crisp popped kernels, there has been a widening area planted in pop corn. In almost every town the pop-corn wagon with its ovens for heating the kernels is as familiar a sight as fruit stands or cigar stores. Except for its use in this form pop corn has little market value. Hence it is not necessary to consider it in further detail.

POINTS FOR THOUGHT

1. Draw in your own way the endosperms of each of the four leading races of corn.

2. After soaking a grain of corn for some hours, split the kernel, and see if you cannot cut out the germ. Make a rough drawing of it as it looks to you.

3. If a pop-corn kernel contained as much hard starch as a dent or flint kernel, would it pop? Why will it not pop until after it has been gathered for some time?

4. If you were going to move from Texas to Maine, and had a splendid Texas seed corn, give reasons why you would not trouble to take this seed corn for planting in your new home.

5. Name a few states in which you would expect only flint corn to be grown as a field corn.

6. Explain why flint and pop corn have no dents in their kernels.

7. Explain why sweet corn is wrinkled.

CHAPTER V

THE GROWING PLANT

If you work hard or if you play hard, you need, in order to keep up your strength, food, water, air, and sunshine. The making of seeds and fruit is the work of the plant. In order that the plant may do its work it must have food, water, air, and sunshine. The water, air, and sunshine which the plant uses are just like the water, air, and sunshine which you use. So far, then, you and the plant are alike in your needs. The food of the plant, of course, is not like yours. How does its food differ from the bread and meat and vegetables on which you live? The plant after its first few days of life lives (1) on water and the plant food which water holds and (2) on the carbon dioxide which it gets from the air.

All animals, including mankind, live on plants, for the animals which man eats feed on plants. The more we can get plants to do for us the better we live. Is it not worth while to study the life of plants so that by proper feeding and tending we may get them to do their best for us? We do not know the plant until we learn how it begins its life, how it feeds during its early and later days, how it

grows, and how it flowers and fruits. We must, in order to get this knowledge of the corn plant, learn what are the duties of the germ, the roots, the stem, the leaves, the tassel, and the silk.

The germ, or embryo, from which the new corn shoot springs, is, as we saw in the last chapter, safely housed in the center of the kernel. There it is so thoroughly protected that it can live a long time. Around the germ lies the endosperm, which is also carefully sheltered by the horny gluten. So carefully has nature wrapped the germ and the endosperm within the hard walls of the kernel that the germ keeps its power to sprout for from two to four years. It is not safe, however, to plant kernels after they are two years old.

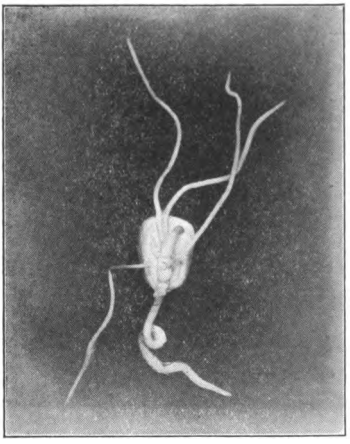


FIG. 29. THE PLANT STARTS TO GROW

When you fill the seed box on your corn-planter with dry, dead-looking seed kernels, you almost wonder whether there is any life in them. However, with a faith born of experience, you plant the kernels. If the ground is in good condition and the season favorable, those dry, dead-looking kernels send up

FIG. 30. THIS PROPERLY PREPARED FIELD WILL NOT LACK AIR OR WARMTH

living shoots within a few days. What moved the kernels to life? What did they find in the soil that they did not find in the crib? Did they not find the four things spoken of at the beginning of this lesson, — air, warmth from the sun, moisture, and food?

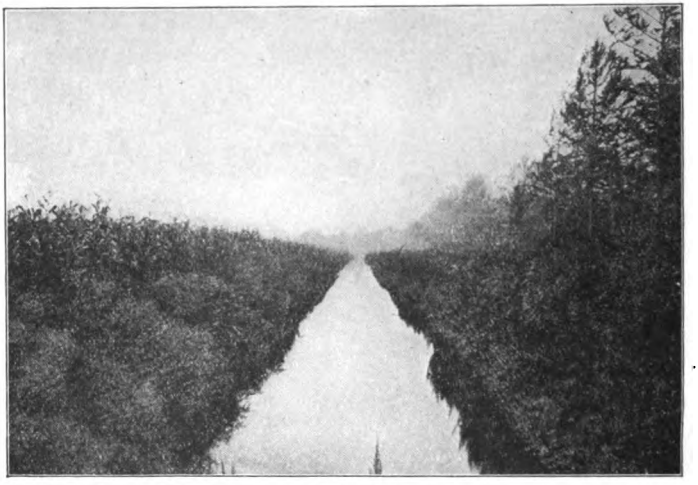


FIG. 31. THE DITCH TAKES AWAY EXCESS WATER

You understand at once how the buried kernels got their air, moisture, and warmth, but do you know how they obtained their food? As soon as those dry kernels felt the spring air, were wrapped in the spring warmth, and were soaked in spring moisture, their germs swelled into life. At their awakening the germs had no roots with which to feed. Hence, while they were forming roots, the young plants in the germs lived on their endosperms.

By the time the plants had used up the food of the endosperms their roots were ready, if the soil was in good condition, to support the young plant.

APPLYING THE LESSON

1. How can you help the soil to get air? Look at the field shown in Fig. 30. It has been deeply plowed, and then harrowed until the soil is open and finely grained. Cannot plenty of air press into such soil?

2. How can you help the soil to get warmth? Will not the deep plowing, and the harrowing, and fining of the soil described above open the way for sunshine to flood into the soil?

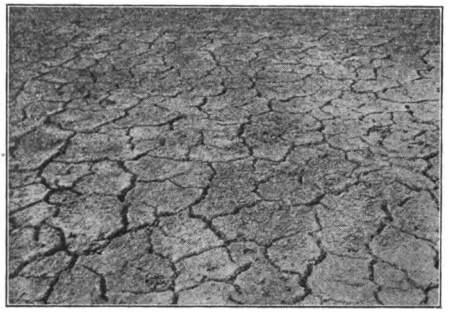


FIG. 32. A PACKED SOIL

3. How can you help the soil to get enough moisture and yet keep it from getting such an amount as to drown the young plant? In Fig. 31 we see one way to help. Do not the ditches like the one shown in the figure carry away water that would keep the ground cold and soggy? Note in Fig. 32 how hard the soil is packed. Would water run off such soil or would it sink in to be used at need by the young plant? Do you see, then, that if you want the tiny young plant to get the air, moisture, warmth, and food that will enable it to do its best for you, you must give it a deeply tilled, harrowed, and fined seed bed in which to grow?

As soon as the germ awakens into life it sends a tiny root, known as the root sprout (Fig. 33), into the soil. This root sprout branches later and forms

other roots. These are called the seed roots and are marked 1 in Fig. 34. They feed the young plant until the first green leaf, shown as the stem sprout in Fig. 35, appears above the ground. Then follow the roots shown at 2 in Fig. 34. These, since they grow from the stem and not from the kernel, are called the first roots. As soon as they start to grow, they seek the topsoil, where they find the warmth which enables them to gather food for the young plant. These roots feed the growing plant for some weeks.

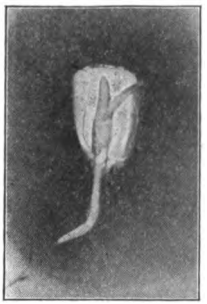


FIG. 33. ROOT SPROUT

Next follow the circle roots, shown at 3 in Fig. 34. They are called circle roots because they grow out from one of the joints, or nodes, of the stem, like spokes from the hub of a wheel. Their manner of growing is shown in the small drawing in the lower right corner of Fig. 34. They grow rapidly and are sometimes eight feet in length. They are the plant's main food-gatherers, and send out many smaller roots where warmth and moisture and food can be found. Then, at a higher joint of the stem (marked 4, in Fig. 34), the second circle roots begin their work; at a still higher joint (marked 5), the third circle roots spread out.

From a joint just above the ground (marked 6), the brace roots, which keep the stalk steady as it

grows, shoot downward. Note that the roots starting at 3 grow straight out at first and later turn down, but that those starting at 4, 5, and 6 grow straight downward. Since they go deeper into the soil than the other roots they are often called

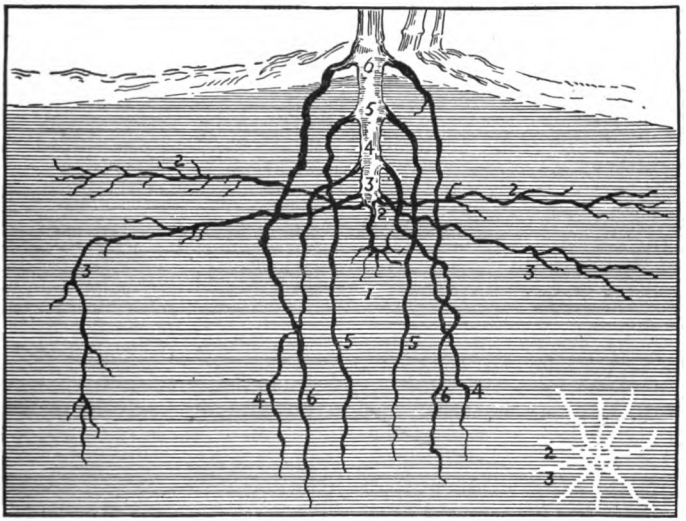


FIG. 34. ROOT SYSTEM

the subsoil roots. When the corn plant is fruiting, these subsoil roots act like a pump to draw water from the soil into the plant. If they are cut the plant is, of course, much injured.

As the plant grows, it forms a mass of roots, spreading for several feet in all directions. In Fig. 38 note how the roots spread from row to row and how near some of them are to the surface.

Soon after the roots of the corn plant begin to grow, fuzzy hairs (see Fig. 36) form near the tips of the roots. These hairs are very useful, for through them the plant gets its food from the soil. The larger roots do not take food from the soil; they merely carry food from the root hairs to the plant.

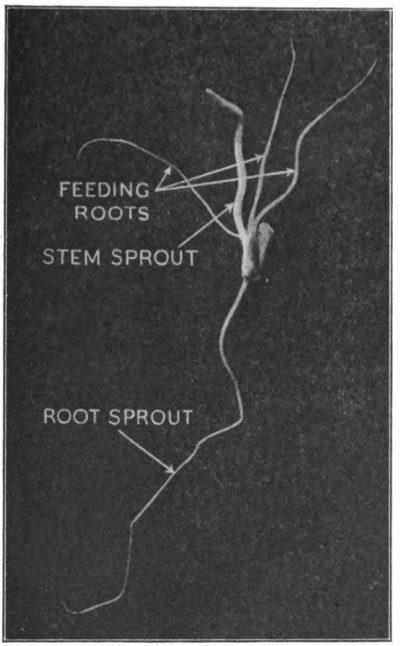


FIG. 35. STEM SPROUT

How do the hairs on the roots get the soil-food which the plant needs? In this way: the water of the soil dissolves the plant food, just as water dissolves sugar, and holds this food in solution in the same way that water holds sugar. With its food in solution the water is taken up by the root hairs. Therefore, in Fig. 37, the hairy roots at work in the soil are called the mine. The larger roots then carry the watery food to the stem, and the stem carries it up to the leaves. Hence these larger roots and the stem are called the transportation system.

In the leaves the plant food brought from the soil meets another form of food. This is the food which the leaves have drawn from the air. From the two is formed the food needed for the growth of every part of the corn plant. Hence the leaves are called the factory where food is made. As soon as the new foods are formed they are distributed by the sap currents of the stalk to all parts of the stalk and to the roots.

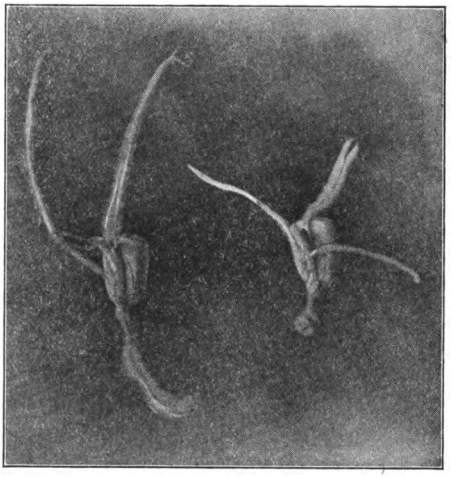


FIG. 36. ROOT HAIRS ON MAIN ROOTS

The food thus distributed is, of course, used for the growth of the plant, and especially for the development of the full-grained ear. The ear, since it finally receives so much of the plant food, may be called the storehouse of the plant. Whenever you look at a cornstalk try to remember first, that the roots are to hold the plant in place and to take food from the soil; second, that the stem is to lift the leaves and flowers high enough to get air and sunlight and to transport food material from the roots to the leaves and

then to the entire plant; third, that the leaves are like a factory in which the food from the roots and the food which the leaves draw from the air is made into nourishment for the entire plant.

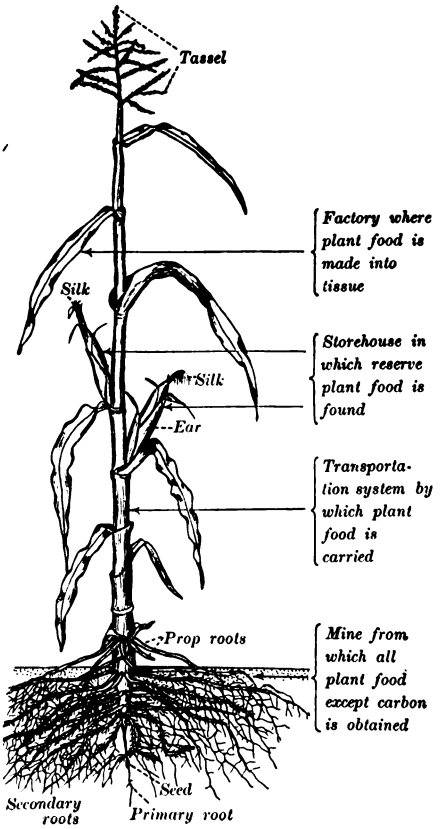


FIG. 37. PLANT AT WORK

APPLYING THE LESSON

1. Corn roots, as you see in Fig. 38, spread from row to row in from thirty to fifty days. You have just seen how necessary these roots are to the plant's growth. Can a corn-grower afford to injure these roots? Would you, therefore, after the corn is six or eight inches high, cultivate with a deep plow? About how deep should you cultivate? Would it be safer to cultivate deeply when the plant is very young than after it is older? See Fig. 39.

2. Keeping in mind how the leaves help to feed the plant, do you think it a good practice to "pull fodder"?

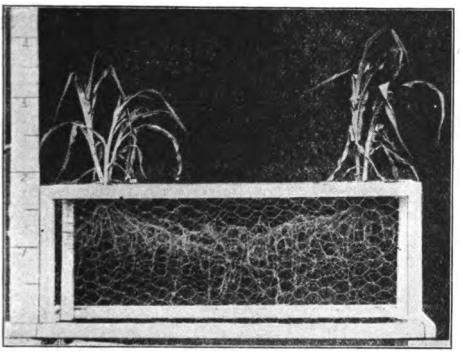


FIG. 38. ROOTS EXTEND FROM ROW TO ROW

3. Roots in their growth will not cross wide spaces in the soil. What injury is done the future plant if the grower puts its seed in cloddy or ill-broken soil? How can you avoid this injury? Could you wisely say, "Spare the harrow and spoil the plant"?

4. As water is the only agent to dissolve plant food in the soil, can you allow any water in a well-drained soil to be lost? How will keeping a dry mulch on top of the soil save moisture? Will a good corn-grower follow the old saying, "Cultivate your corn four times and then quit"?

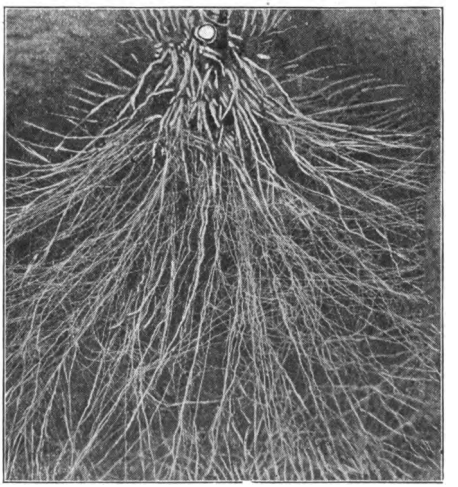


FIG. 39. FEEDING ROOTS FILL THE SOIL

The cornstalk, made up of roots, stem, and leaves, the uses of which we have just seen, bears the flowers and fruit. You no doubt know that the tassel and silk are the

flowers, and the ear is the fruit. Without the flowers there would be no fruit, or filled-out ear. How do the tassel and silk aid the ear in filling out its kernels?

Corn, unlike most field crops, has its flowers in two separate places. The tassel, which is one of the flowers, is, as you have seen all your lives, at the

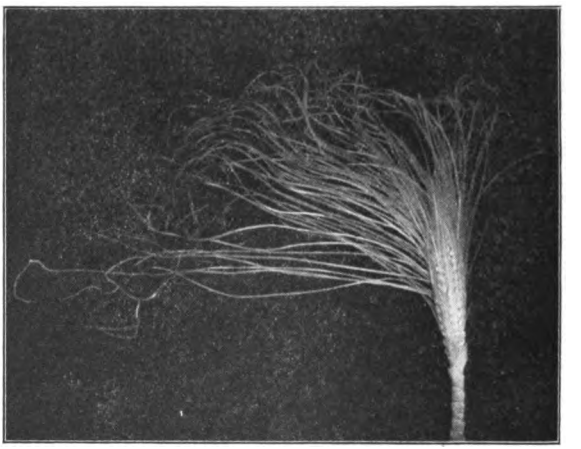


FIG. 40. CORN SILKS LEADING TO EACH KERNEL

top of the stalk. The silk, which is the other part of the flowers, is at the tip of the ears. What does the tassel do for the ear? It bears the small yellow grains called pollen. The tassel forms a great deal of pollen and the wind scatters it far and wide. After a wind or a gentle shower in tasseling time, you have no doubt seen the ground almost covered with pollen. It is said that for every grain of pollen needed by the silk six thousand grains are produced by the tassels.

The silk too is abundant. What does it do for the ear? A close look at Fig. 40 will help you to understand the duty of the silk and the pollen. On the cob you see rows of unformed kernels. They are just ready to grow, but they will not grow until both pollen and silk have done their part. From each tiny kernel you notice that a single thread of silk forms and makes its way to the tip of the ear. As there are many kernels, there are many threads dangling from the ear. These silks are nature's traps to catch the pollen from the tassel above and bear it to the waiting kernels. No kernel will grow until a grain of pollen drops on its silk and grows down the silk tube to that kernel. Just as soon as the kernels receive the pollen from their silks they push outward in vigorous growth. If a single kernel fails to get its grain of pollen, it will remain unformed, or barren, as it is called. In Fig. 41 you can see an ear in which some silks failed to carry their pollen, and the barren kernels resulted. If all the silks in an ear fail in their job you will have a cob without grain; or if some fail and others do not, you will have partly filled ears, such as are shown in Fig. 42.

FIG. 41. SILKS FAILED TO DO THEIR WORK

The ear grows out from the stalk on a short branch known as the shank. The ear is made up of husks to protect the tender kernels from weather and insects, of cob to hold the kernels, and of kernels to produce new stalks. The shank grows out from a joint, or node, as it is called, on the main stem. If the shank grows too long, as we shall see in the discussion of the shank, the weight of the ear is likely to break the shank from the stalk. If the shank is too short the ear is held so straight that too much rain may enter and cause mold.

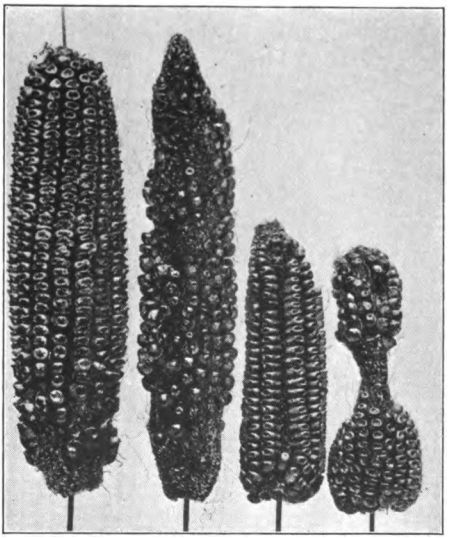


FIG. 42. EARS SHOWING FAILURE OF SILKS TO CARRY POLLEN

In some ears the husks fit tightly around the ear. In others they inclose the ear loosely. Usually the husks entirely cover the ear, but sometimes they grow too short. In this case the tip of the ear is, of course, left uncovered, and birds and insects find it easy to rob the ear.

The stalk may have only one ear or it may have several. Pop corns usually bear more ears than either the flint or dent corns. A single pop-corn stalk has been known to produce as many as nineteen ears. As a rule, flint corn is likely to have more ears than dent corn. The number of rows of kernels on the cob varies greatly. In the most common kinds there are usually from eight to twenty rows. The number of rows is always an even number. If odd numbers do occasionally occur, they are the result of some injury to the tassel. Each breed of corn generally has a fixed number of rows. For example, Hickory King usually has eight rows; Horsetooth, twelve rows; but some, like Ladysmith, vary from fourteen to eighteen rows. Of course an increase in the number of rows will give an increase in the number of grains. You must not think, however, that an increase in the number of grains will necessarily give a larger yield, for the grains may be smaller and hence weigh less.

The number of grains to the ear varies greatly in different kinds of corn and varies with the season and the richness of the soil.

POINTS FOR THOUGHT

1. When will a kernel not sprout?

2. In what way does your food differ from the food of a corn plant?

3. How does lack of rain cut off a plant's rations?

4. From the way in which a plant grows, explain how hail or army worms injure corn.

5. If you were to tie a paper sack over an ear of corn when pollen was just forming, would grains grow on the cob? Why not?

6. If you wanted to share a neighbor's improved kind of corn seed, could you do it by planting your corn near his and cutting all your corn tassels off before they formed pollen?

7. Could you expect a good ear of corn from a stalk growing alone in the middle of a forty-acre field?

8. It takes about sixty gallons of water to grow one pound of dry cornstalk. How much water will be needed for a yield of six thousand pounds of dry cornstalk, which is about the amount produced by an acre yielding forty bushels?

CHAPTER VI

MARKINGS OF GOOD SEED EARS

Man, with all his boasted powers, is very helpless in controlling the yield of his crops. There are only three ways in which he can, by his own work, increase the yield of his plants. These are first, by selecting the best seed; second, by cultivating in the wisest way, including proper drainage of the soil; third, by fertilizing the soil so as to meet the needs of the soil and of the plant. These are his only weapons, for, of course, man's share in production is puny in comparison with what nature does in providing life, rainfall, and sunshine. Surely, then, man ought to learn to use his three weapons in a masterful way. The ear shown in Fig. 43 is a result of the wise use of these three weapons. At a corn show its perfect breeding won a prize of a thousand dollars. The giving of this prize shows people's interest in seed.

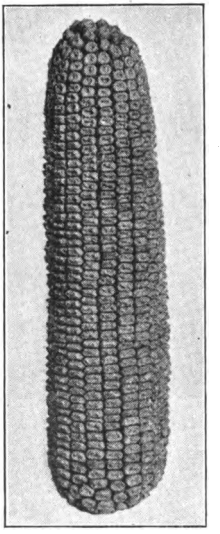
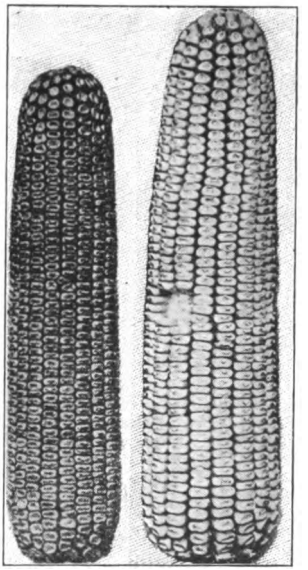


FIG. 43. A THOUSAND-DOLLAR TROPHY EAR

Every young plant which grows from a seed lives for a time on the food which is stored in the seed. Its start, its vigor, — in truth, all its power to grow, — must be drawn from the dying seed. Can the farmer, then, who depends for success on hardy, fruitful plants busy himself about anything more important than good seed?



A *B*

FIG. 44. EARS ALIKE IN APPEARANCE BUT DIFFERENT IN VALUE

Compare the two ears shown at *A* and *B* in Fig. 44. Do you notice any very great difference between them? Are they not about the same size? Do not their grains seem equally sound and equally well formed? Are there not about as many grains on one as on the other? Yet, in spite of their seeming equality of value, the one marked *A* sold at auction for one hundred and fifty dollars; the one marked *B* can be bought on any corn market for a few cents. Can you give the reason why one so far surpasses the other in price?

If you have ever tried to buy a registered pig or a registered calf you will easily understand the

difference in the price of these two ears. You always find in buying an animal from a noted strain that you have to pay a higher price than when you buy an animal from an unknown breed. The famous breed has already proved its value for several generations.

It is the same way with the two corn ears. For twenty corn generations the seed from which *A* was grown had been selected in the field as showing the best traits of a good ear. This high-priced ear had the best traits of these twenty generations. The buyer was sure that with good seasons and proper cultivation this ear would produce the kind of stalk, ear, and grain that he wanted. The ear marked *B* had no such history; it was chosen from a pile of corn because it looked well. The corn grown from it might be good or it might be poor. There was no certainty that even under the best conditions its grains would produce such corn as a grower would be proud of. Is it, then, remarkable that a farmer who grows thousands of bushels of corn each year was willing to pay a handsome price for just such seed as he was sure would produce a paying crop?

If you are planning to plant one acre, or a thousand acres, what then is the first thing for you to decide? Is it not that you will plant only the very best seed? There are three ways in which to get seed. They are as follows:

First, buy it from a distant grower or dealer.

Second, buy it from a neighbor.

Third, raise it yourself.

Which one of these ways is best? Let us see. Frequently at corn shows or at fairs a grower in search of good seed finds excellent ears of corn. Often in seed catalogues he sees cuts of splendid-looking ears similar to those shown in Fig. 45. He may think that if he plants seed from these ears he will get equally good ears. This is not necessarily true, however, for several reasons:

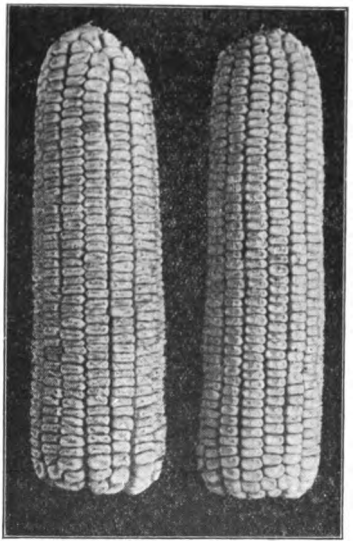


FIG. 45. SHOWY EARS THAT MAY NOT MEET YOUR NEEDS

First, as we have just seen, these showy ears may have no inherited good traits. They may or may not produce ears as good as themselves.

Second, even if the ears shown are from the very best strains of corn which have been carefully bred for years, they may not produce well away from their own homes.

Third, corn does best in soils like that on which it grew. These ears may have grown on soil very different from that in which the grower wants to plant.

Fourth, the best seed corn is apt to lose in value if planted on land that is not about the same level above the sea as the land on which it has been bred. If these showy ears grew on land either much higher or much lower than the land on which they are to be planted, they would not be certain to make the best seed.

Corn seed usually produces most heavily in the sections in which it was bred. Tests at several of the experiment stations show a difference of from two to thirty-one bushels an acre in favor of home-grown seed. Hence, if you decide to buy your seed corn, it will be best to buy from some honest, careful breeder in your own section or, better still, in your own county.

A change from east to west or from west to east does not generally make so much difference in climate as does a change from north to south or from south to north. Therefore, in buying seed a grower will do well to buy from sellers east or west rather than very far north or much south of his farm.

If you are going to buy seed corn you will do well to remember four things:

First, buy the seed in the ear. You can then see the entire ear and tell whether it is the kind you want. You can examine grain, rows, butts, tips, and cob.

Second, if your farm is in a climate in which frost comes early, you had better buy your seed from

sellers north rather than very far south of your home; such seed ripens in less time than Southern seeds which have a long growing-season. On the other hand, seed from a cold climate is not good for a Southern farm: the corn does not use all of the growing-season; hence the yield will fall short.

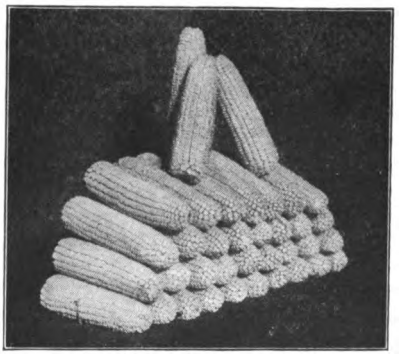


FIG. 46. SHOW EARS

Third, good seed bought at a distance is likely to do better after the second or third year than it will the first year. Corn makes itself at home in a few years.

Fourth, do not stake your whole crop on any one kind of new seed. Wait until the seed has proved itself good before you risk an entire crop.

APPLYING THE LESSON

1. If you live in Indiana would you be safe in buying seed corn from Georgia? If you live in Georgia would you do well to buy even the best seed from Illinois?

2. Why should you not buy seed from the mountain section of Tennessee if you want to plant on the prairies of Kansas?

3. At a corn show in Chicago a boy from North Carolina was struck by the fine ears of corn shown in Fig. 46. Could he safely stake his crop on seeds from these ears?

4. Two stalks of corn grew in the same row. They were each equally distant from neighboring stalks, were planted, cultivated, and fertilized, in the same way. Of these two, one produced more grain than the other. Why?

5. Suppose a bushel of corn will plant seven acres, and that one bushel of poor seed costs seventy cents and one bushel of fine seed costs two dollars and ten cents. If the better seed yields four bushels an acre more than the first, was it not cheaper to pay two dollars and ten cents for the seed than to pay seventy cents?

Instead of buying your seed, however, you will find it far more interesting and more profitable to raise your own seed. To do this you will have to learn to tell a good stalk and a good ear in order to select the best for seed.

The Stalk

You would not expect a weak, sickly man to be able to dig a deep ditch for you. Could you any more expect a weak, sickly stalk to bear a well-fruited ear of corn? Must you not have a vigorous stalk if you wish a vigorous ear? Do not forget, however, that by a vigorous stalk we do not mean a tall stalk. Cornstalks vary in height from six to twenty feet; sometimes they grow even taller. However, plants above ten feet in height seem to spend their strength in making too much stalk instead of grain. On the other hand, a small, feeble stalk will not make a fine ear. Compare the size of the two ears in Figs. 47 and 48. The stalk shown in Fig. 47

FIG. 47. A HEALTHY STALK

has a good body; its blades are wide and abundant; it is thick at the bottom and tapers gradually toward the top; if you could see its roots, you would find them thick, feeding widely, and bracing the stalk against winds. The stalk in Fig. 48 is, as you see, undersized; its leaves are scant and narrow; hence its ear is small. Compare also the two ears in these figures. Each is what might be expected from its stalk. Shall you not, then, start your seed selection notebook records with the following entry?

NOTE 1. My seed should come from a well-grown, vigorous, abundantly bladed, well-shaped, well-rooted stalk, one that is not too tall nor yet too low.

Height of Ear on the Stalk

As you see in Fig. 49, the different kinds of corn vary much not only in the height of their stalks but also in the height of the ears on the stalk. You would have to jump to gather the ear on the right stalk and stoop to pull the ear on the left stalk. If you are to gather your own corn, would you not prefer the ears to grow at a convenient height from the ground? Look at the ideal hill of stalks with their ears at the same height from the ground in Fig. 50. If you prefer growing corn with that sort of stalk, you will have to plant seed that will make such stalks.

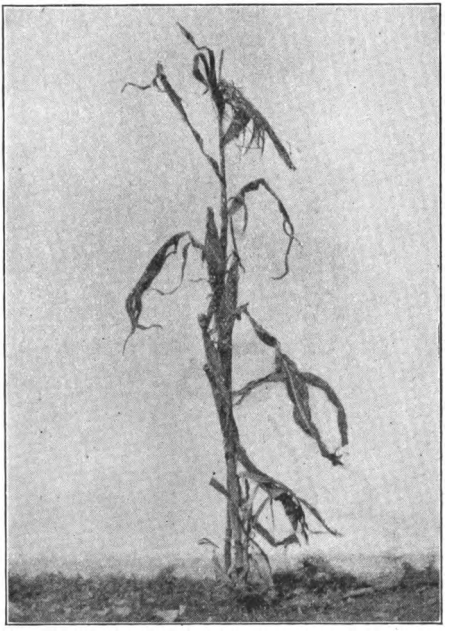


Fig. 48. A Feeble Stalk

If your corn ever shows a desire to grow its ears too high on the stalk, you can, by selecting seed ears from stalks having low ears, check this desire.

On the other hand, if the ears begin to grow too low on the stalk, you can likewise, by selecting seed from ears higher from the ground, prevent this trouble. In Fig. 51 the corn on the left has been bred from low-eared stalks. The line across the stalks shows the difference in height of ears in the two fields.

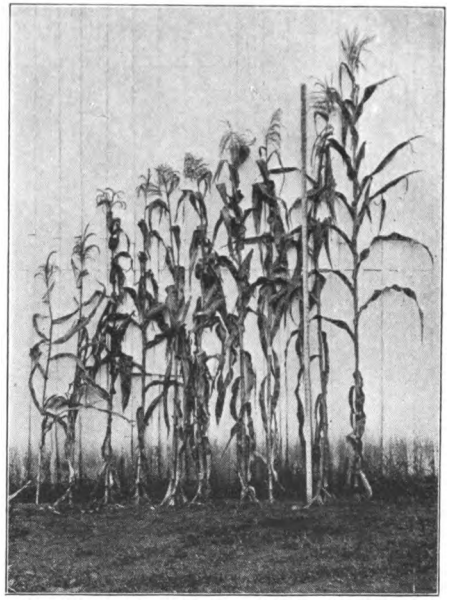


FIG. 49. VARYING HEIGHT OF STALKS

But comfort of harvesting is not the only thing to be thought of in the height of the ear. Do you not recall how easy it is for windstorms to blow over your corn in spite of its brace roots? Will a stalk not blow over more readily if the ear is high?

On the other hand, unless you want your corn to ripen early, the ears ought to be fairly well up from the ground. As a rule, ears that grow low on the stalk ripen early and the stalks are low. Corn, to make heavy, well-filled ears, needs as long a

growing-season as the climate will permit. Hence the low-eared kinds, inasmuch as they do not use all the growing-season, do not make heavy yields. Ears that grow higher on the stalk take more time to mature. Hence, under favorable conditions, they can produce heavy ears. The stalk on the right in Fig. 49 took one hundred and thirty days to ripen its ear. The one on the left took only one hundred and five days. Of course you do not want stalks that are very tall, for such stalks grow in height at the expense of the ear.

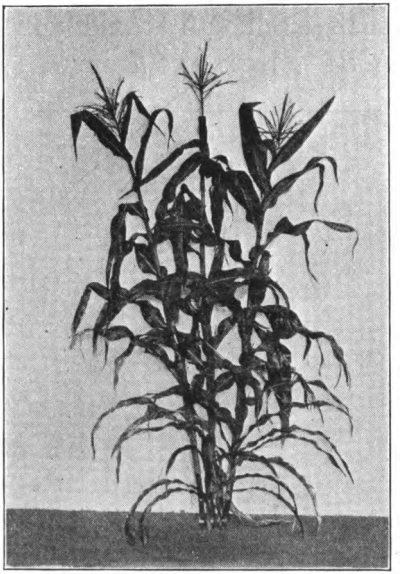


FIG. 50. EARS AT A CONVENIENT HEIGHT

However, some students of this book may live in sections in which, on account of early frosts, corn barely has time to ripen. If so, those students have probably seen this happen: of two fields planted at the same time and tilled in the same way, one ripened its grain before frost; the other did not, and was ruined. Why was this? The next time any of

you see such a difference, notice the position of the ears on the stalk. The field that escaped had stalks with low ears. Hence, these stalks ripened faster than those which had their ears high. In such a climate would you not with this fact in mind select seed from a low-eared kind of corn?

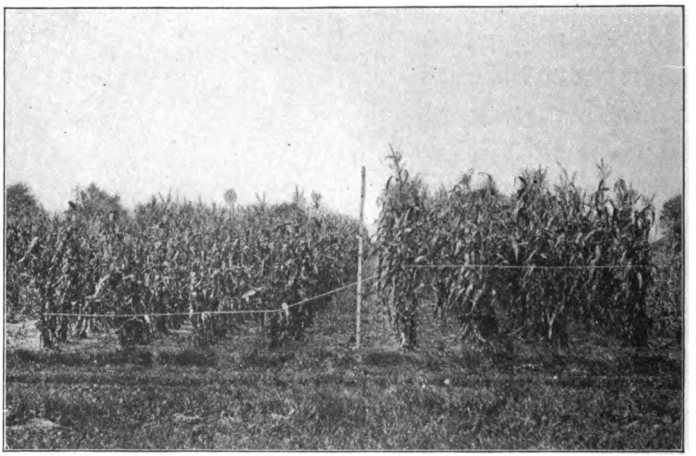


FIG. 51. CHANGING HEIGHT OF EARS BY BREEDING

In Fig. 49 you saw at what different heights ears grow on the stalks in some fields. Such fields are not so surely pollinated as fields in which the ears grow at an even height. Keep three facts in mind and you will readily see why.

First, in dry climates corn pollen lives about three days; in fairly moist climates, from seven to eight days.

Second, the pollen is scattered by the wind. A tassel does not necessarily furnish its own silk with pollen.

Third, ears low on the stalk ripen earlier than those higher.

Now in a field such as is shown in Fig. 49 some stalks will have tassels and silk ready for pollination

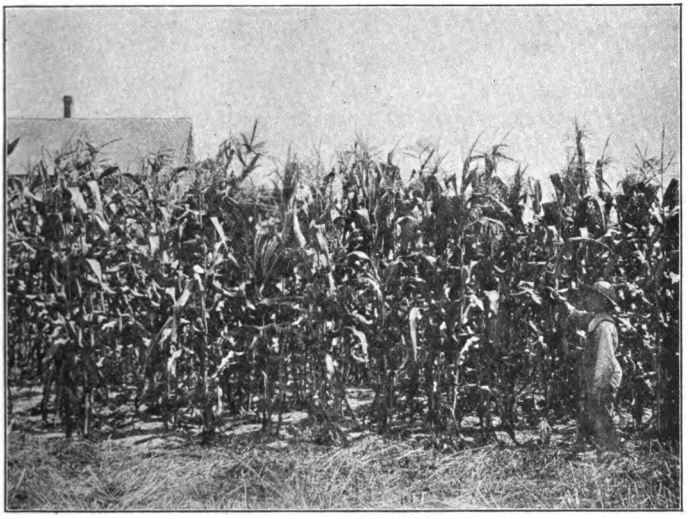


FIG. 52. EARS READY FOR POLLEN ABOUT THE SAME TIME

sooner than others. Hence pollination must go on from day to day from a comparatively small number of stalks. In a field similar to that shown in Fig. 52 all the ears are ready for their pollen at nearly the same time, and the pollen is formed about the same time. Hence the pollen falls in a perfect shower and is likely to reach all the silks.

We are now ready, are we not, for the second entry in our books? It will be:

NOTE 2. I will select my seed from ears that are borne at a uniform height on the stalk.

THE SHANK OF THE EAR

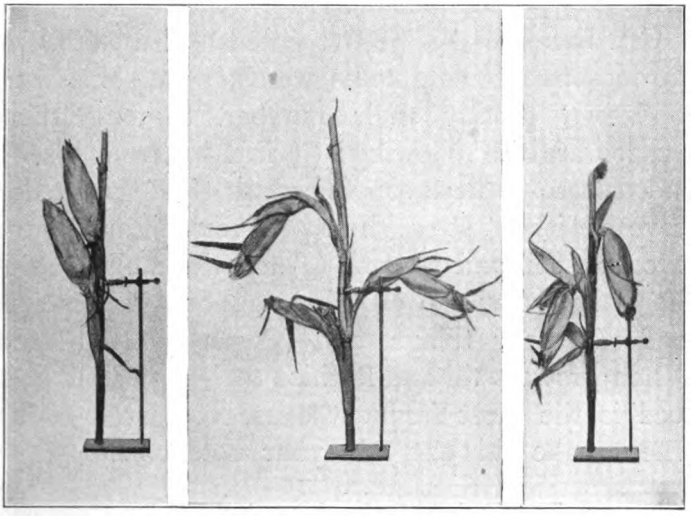
The ear grows from a branch of the stalk, known as the shank. Examine the way in which the ears in Fig. 53 grow from their stalks. The ears on the left are borne on short shanks which hold them up almost straight. The ears on the right have longer shanks and hang downward. Unless the left ear is entirely covered at the tip by the husk, could not rain easily enter the ear? What effect would this produce? Could rain so readily make its way into the ear on the right? Would this ear, then, not be a safer one than the other to select for seed? The shanks of the center ears are entirely too long. In case of high winds these ears would likely be torn from the stalk and rot on the ground. At the Illinois Experiment Station, stalks with straight-up ears and stalks with hanging ears were bred. It was found by actual count that the hanging ears contained only 2 per cent of moldy or rotted ears, while the straight-up ears had 5 per cent of such ears.

Are we not ready for a third entry in our note-book?

NOTE 3. I will select my seed from ears that hang down from the shank.

Barren Stalks

Stalks on which no ears are borne are called barren stalks. Such stalks produce tassels and shed their pollen like other stalks, but make no ears,



A *B* *C*

Fig. 53. Bad and Good Shanks

A, too short; *B*, too long; *C*, good

or only nubbins. Sometimes the barren stalks grow to full size and look perfectly healthy. However, most of these stalks show a lack of vigor. Some corn-growers think that as many as one ear in every seven is barren. Would this mean that one acre in every seven produces no corn?

If one of these barren stalks grows beside two productive stalks, would it injure these good stalks? Would it not steal moisture and plant food from them? Would it not act just as a weed acts? Would it be well for the pollen from such a stalk to fall on the silk of productive stalks?

Can barren stalks be prevented? If we think of the reasons for such stalks, we shall see some ways to lessen greatly their number. Among these reasons are the following: (1) injuries from insects and disease — these sap the vigor of the plant and leave it without strength to produce an ear; (2) unfavorable soil and season; (3) too thick planting — the stalks when too crowded cannot get sufficient food; (4) poor tillage, and (5) poorly bred seed. When growers till and fertilize their corn well, poor seed is the most frequent cause of barren stalks. Then make this entry in your notebook:

NOTE 4. To keep down the number of barren stalks, I must plant pure-bred seed, and cultivate and fertilize my corn with all the skill I can.

APPLYING THE LESSON

A member of the Boys' Clubs bought a piece of poor land in South Carolina. He was afraid of barren stalks and made up his mind not to have any in his field. The first spring he planted his stalks at a good distance from one another in the row and put the rows wide apart. Was this right? He picked for seed some large ears from his crib. Was this right? He had a dry season and tilled his corn as often as he possibly could. Was this right?

On most of his land he planted cowpeas at the last tillage of the corn. Was this right? In the fall he followed his peas by clover. Was this right? In the second spring he planted corn after the clover, and this time he seeded his land more thickly. Was this right? He planted this year some South Carolina seed that had taken the first prize at the Columbia, South Carolina, Corn Show. Was this right?

On the part of his land not sown in peas and clover, he scattered stable manure rather thickly. Was this right? On this land too he planted more closely than the year before. Was this right? Here he tried some prize seed from Mississippi. Was this right?

POINTS FOR THOUGHT

1. Draw a corn kernel and show the position of the embryo. Show also in the drawing where the food for the embryo is stored.

2. His neighbors laughed at a young farmer for paying forty dollars for an ear of corn for his seed patch. Explain why you think he may not have been wasteful of his money.

3. A child can become better than its parents. Can an ear of corn be better than its parents? Good parents in a good home often have worthless children. Can good corn parents in a fertile, well-cultivated field produce worthless ears?

4. A bright boy who wanted to grow corn inherited a farm on which corn had never been grown. A neighbor offered to sell him some tried corn at $4 a bushel. A seedsman six hundred miles north of his farm offered some showy ears at $2 a bushel. Another seedsman three hundred miles south of his farm sent him a catalogue showing handsome ears at $2.50 a bushel. Which would he be wise to buy?

5. A farmer after riding on horseback through his field boasted that his corn was so fine and tall that he could not touch the tassels with his riding whip. Was this an intelligent boast? Give three reasons for your answer.

CHAPTER VII

MARKINGS OF GOOD SEED EARS (CONTINUED)

NUMBER OF EARS TO THE STALK

Your seed should be chosen to give you the greatest number of pounds of dry shelled corn to the stalk. Of the three stalks represented in Fig. 54 one stalk bears only one ear, one bears two ears, and one three ears. Shall you select seed from a stalk that yields one, two, or three ears? This is a vexed question with growers. Some stoutly insist that one large well-filled ear will produce the greatest amount of corn. They point out the fact that, as a rule, the size of the ear decreases as the number of ears increases. Others urge that a two-eared kind is the largest producer. These contend that you can get a greater weight of corn from two medium-sized ears than from one large ear. Stalks bearing more than one ear are called prolific stalks, and seed from such stalks is called prolific seed.

Is there any way to settle this difference of opinion except by actual trial in the field? The North Carolina Experiment Station made exactly this trial for five years. The one-eared kinds and the prolific kinds were planted in alternate rows in the same

field. This, of course, gave each the same kind of soil. The seasons, of course, were exactly alike for each kind. Each kind was planted at the same time, fertilized, and tilled in exactly the same way. At the end of the season the returns from each were carefully weighed. The prolific varieties yielded an average of thirty-seven bushels to an acre. The one-eared varieties averaged only twenty-nine bushels — a difference of eight bushels in favor of the prolific kind.

FIG. 54. STALKS WITH ONE, TWO, AND THREE EARS

The Alabama Experiment Station made the same tests for four years. This station found that prolific varieties yielded thirty-three bushels to the acre while the one-eared varieties yielded only twenty-seven bushels. The Tennessee Station after careful tests declared that the prolific kinds yielded more than the one-eared kinds.

However, will it be fair to conclude that, because the prolific kinds yielded most in these three Southern states these kinds will be the heaviest yielders all over our country? We must not forget what a difference climate makes in a crop. The

prolific kinds of corn take longer to ripen their ears than do the one-eared varieties. In states like Kansas, Iowa, and Illinois, where the growing-season is much shorter than in the South, growers want a corn that will be certain to ripen before cold weather comes. Would the prolific kinds then be as good for these colder states as they would for the warmer states? If you live in a cold state, would you therefore plant a prolific variety?

Moreover, on poor soils good one-eared varieties are generally the best producers. Hence, if you are so unfortunate as to have to plant your corn on poor land, should you try to grow prolific corn? Would not seed from a choice one-eared variety be safer for you?

As another note in regard to seed selection, let us write:

NOTE 5. If I live in a warm climate and have rich land, I will select a prolific variety of dent corn for seed, but if I live in a cold climate, I will choose a good one-eared variety for seed.

WHICH OF TWIN EARS TO SELECT

If you are using a prolific seed, you may be puzzled which of the two ears borne on a stalk to select for seed. Examine the stalks and the ears in the field. From the stalks bearing the two best ears select the better ear of the two. This will usually be the top ear. But if both ears are good, there is no reason why you should not use both for seed.

The Ear and its Qualities

Corn is grown largely for its ears — they are the crown of a year's work. If the ears are not full

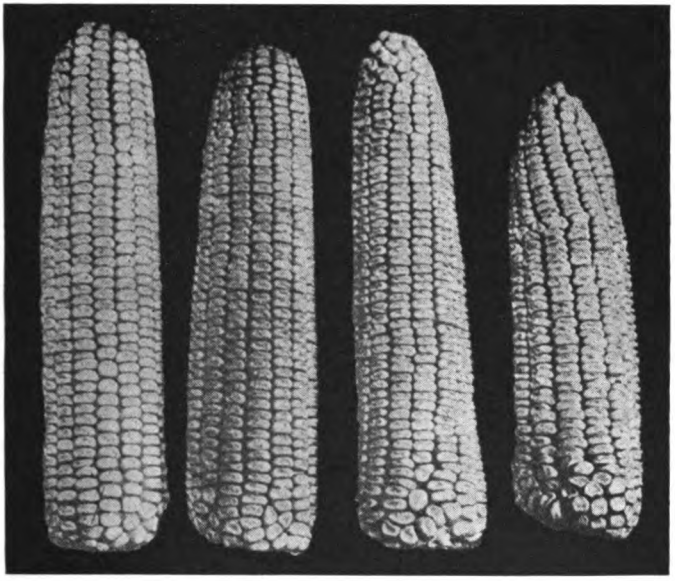


Fig. 55. Well-Shaped and Poorly-Shaped Ears

fruited, the labor of the grower is not properly rewarded. If we are seeking to grow seed that will make fruitful ears, we must know thoroughly all the marks of a fine ear.

Contrast the ears in Fig. 55. You see at a glance, as far as shape goes, what is wanted in a seed ear

and what is not desired. Ears No. 1 and No. 2 have all the outward marks of excellent seed ears. Ear No. 3 begins to taper too much. Ear No. 4 is wretched. In spite of its attractive shape is it possible that ear No. 1 might not be a good seed ear? Explain your answer fully. Let us see what advantages in shape ears No. 1 and No. 2 have over ears No. 3 and No. 4.

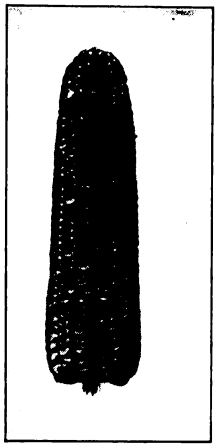
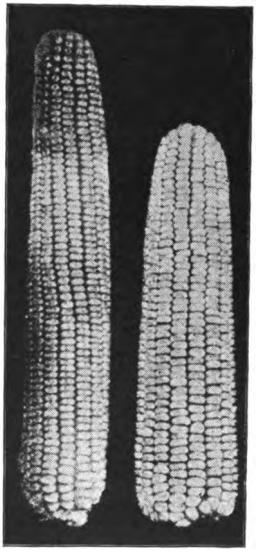


FIG. 56. HERE THE KERNEL ROWS ARE PARTLY LOST

Ears No. 1 and No. 2 are cylindrical, that is, they taper very little from end to end, and this is the shape desired by most growers, for it is the only shape in which the same number of rows can grow from end to end of the ear. In a tapering ear like No. 3 and No. 4 there must be either some short rows, as shown in Fig. 56, or the kernels at the large end must be larger than those at the small end, or have more space between them. Follow the rows of kernels in ear No. 1. Do they not run straight from bottom to top? Is this true of ear No. 2? Which has the larger number of kernels? In which are the kernels most nearly of the same size? Will kernels of different sizes drop well from your corn planter? Which has the wider spaces, or furrows, between the rows?

Length and Girth of Ear

As climates and soils in the corn-growing area of the United States vary so widely and affect the crop so markedly, it is impossible to fix a standard of length for an ear. Where the growing-season is long and the soil fertile, large ears are usually the best producers among the one-eared varieties. But very long and narrow ears are to be avoided, for in such ears the kernels are generally shallow. In areas that have a short growing-season smaller ears should be selected. Of the one-eared varieties ears ranging from nine to eleven inches in length are perhaps best for seed. Of prolific kinds the best ears range from eight to nine inches in length.

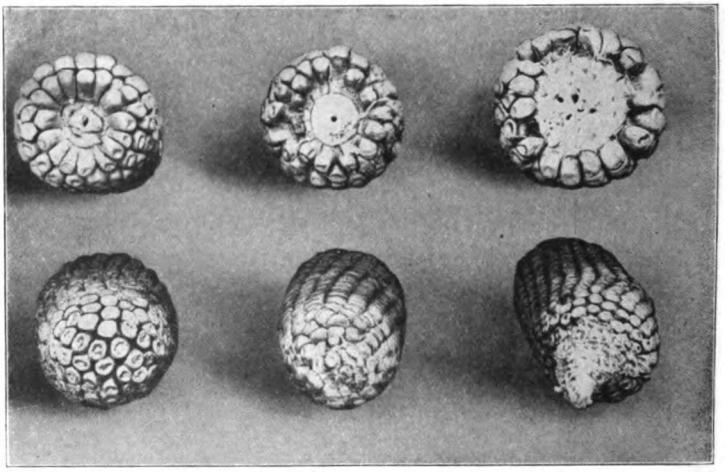


1 2

Fig. 57. Length and Girth of Ears

In addition to the length, the girth, or circumference, of the ear is always important. The ear should have circumference enough to hold a large number of rows of kernels. Compare the circumference of ears No. 1 and No. 2 in Fig. 57. Will not an ear like No. 2 have more room to hold its rows of kernels than ears like No. 1? Ears of the

one-eared varieties vary from twelve to twenty-four in the number of rows; the prolific varieties from eight to sixteen. It will be prudent not to select



1 2 3

FIG. 58. BUTTS AND TIPS

seed from any one-eared variety that has fewer than sixteen rows or from any prolific variety that has fewer than twelve rows.

BUTTS AND TIPS

The end of the ear next to the stalk is called the butt; the opposite end is known as the tip. There should be no wasted space on the cob. Every part of the cob should be covered with kernels. The

yield of course will be greatest if both butts and tips are well filled out. A well-filled butt is more to be sought than a well-capped tip. Do not, however, select an ear solely because its butt and tip are nearly perfect. The size of an ear and its suitability to soil and climate are too important to give way to a search after perfect butts and tips. Fig. 58 presents a series of butts and tips. Give reasons for saying that No. 1 is a good butt. Why is No. 3 a poor butt? Does No. 1 appear to have a large or a small cob? Does No. 3 appear to have a very large cob? Is there much wasted space in No. 1? in No. 3? In the tips in the bottom row do you see any wasted space in No. 1? Is there such wasted space in Nos. 2 and 3? Would these six ears not yield more if all the ears had butts and tips filled as well as Nos. 1 and 2 have?

Space between Rows

The spaces, or furrows, between the rows of kernels should not be wide, but yet wide enough, in sections with a short growing-season, to allow the ear to dry thoroughly before frost. Ears with wide furrows are apt to have rounded and not deep kernels. Such rounded kernels do not fill solidly the space on the cob. The ear on the left in Fig. 59 has straight and small furrows, yet the furrows are wide enough for air to enter and cause it to dry. In

the middle ear the furrows are nearly straight but rather wide. In the ear on the right the furrows are not only far too wide but very much out of line. Which would you be sure to select for a seed ear?

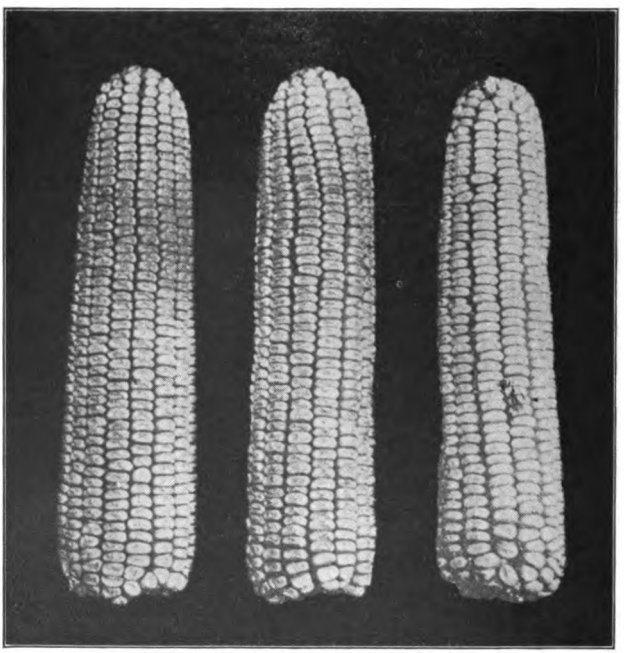


FIG. 59. EARS SHOWING SPACES BETWEEN ROWS

COLOR OF EAR AND COB

Each variety of corn has a natural or regular color. All carefully bred varieties are expected to be uniform in color. For example, white dent corns should yield white kernels, and yellow dents yellow

kernels. Any mixing of colors shows that an ear or its parent ears received some pollen from stalks of another variety. Of course, no ear that has been so pollinated should be used for seed. In Fig. 60 there is shown an ear in which the color is a result of stray pollen. Even if such an ear has an almost perfect shape and has well-shaped kernels, good spacing between the rows, and excellent butts and tips, should you use it for a seed ear? The cobs, too, should have a regular color. With some few exceptions, such as the Calhoun Red Cob, the white and the yellow varieties should have white cobs and red varieties should produce red cobs.

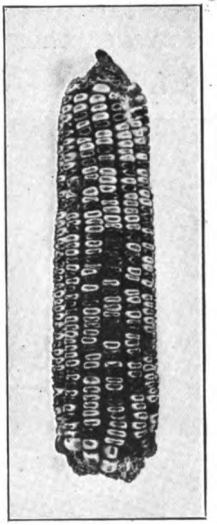


FIG. 60. VARYING COLOR OF KERNELS

As a rule the white varieties have proved heavier yielders than the colored varieties. Yet, in spite of this fact, some yellow varieties outyield many white kinds. The yield is not governed by the color, but will, of course, depend on the size of the ear, time of ripening, suitability to soil and climate, kind of kernels, a proper filling out of the kernels, the amount of grain to the cob, the amount of fertilizer used, and the excellence of the cultivation.

Size of Cob

The cob is merely a frame on which the kernels are fastened. The larger the cob, if all other things are equal, the more kernels can be fastened on it. However, there are objections to a very large cob; its grains are apt to be shallow and it is slow in drying. If the cob is so large that it holds moisture too long, its kernels may be injured by mold or by early frost. On the other hand, cobs that are very small cannot furnish framework enough for a large number of kernels. Hence a cob which is neither too large nor too small makes the best frame for the kernels.

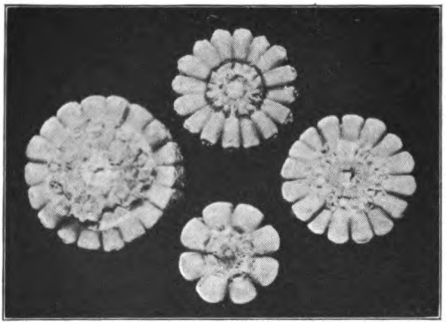


Fig. 61. Cobs of Different Sizes

In Fig. 61 compare the four cobs with their kernels. Select the cob that makes the best frame for its kernels. Which cob is too large? Which too small? Count the number of kernels around each cob. The biggest cob has the largest number of kernels around it. Would this prove that the total number of kernels on this cob would weigh more than the total number of those on the ear to the

right? The ear on the left has eighteen kernels around the cob. The one at the bottom has only eight kernels girdling it. Would this prove that the first ear would yield twice as much as the second ear? Which cob would be slowest in drying? Which ought to dry most quickly?

APPLYING THE LESSON

1. A banker offers as a prize for the highest yield from one acre a scholarship in the State Agricultural College. If you entered for this prize, would you select for seed a one-eared or a two-eared variety?

2. Describe the shape of the ears that you would want for seed.

We now seem ready for the next note in our seed-selection book, as follows:

NOTE 6. From the best-bred ears on my own farm or in my own community, I will pick out for seed such as are firm, heavy, cylindrical, medium in size rather than very long or short. I will also take care that my seed ears have a good girth or circumference, with their butts and tips well filled, with straight and narrow furrows, with a cob not too large nor yet too small, with a strong short shank, and with uniform, well-shaped kernels.

THE KERNEL

Corn is, of course, grown largely for the kernels. No matter how much pleasure we may take in the grace of the stalk or in the richness of the harvest colors, it is, after all, around the tiny kernels with their food for man and beast and with their power to furnish seed for the next crop that our chief

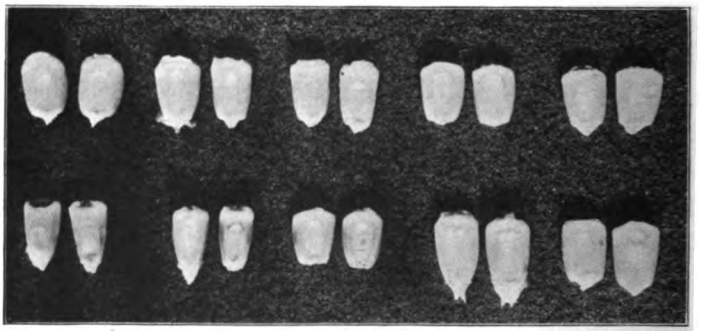


FIG. 62. VARYING SHAPES OF DENT KERNELS

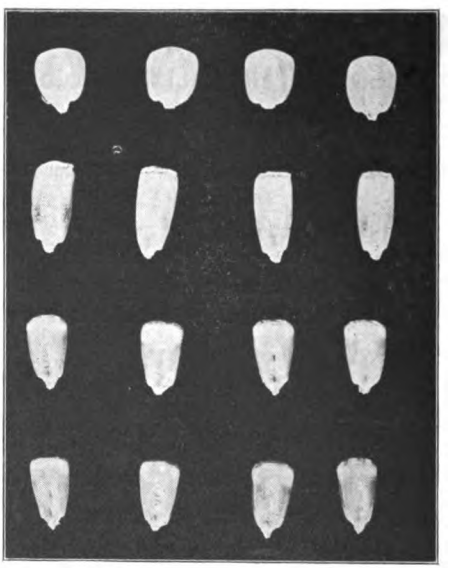


FIG. 63. COMPARE THESE KERNELS

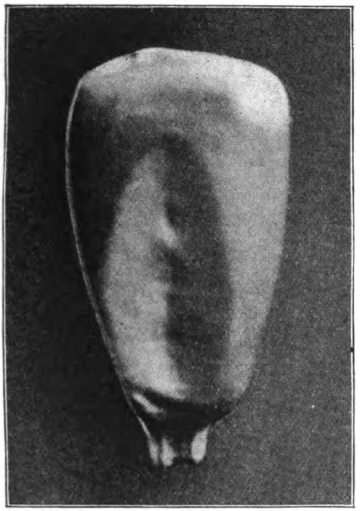


FIG. 64. THIS SHAPE BEST

interest centers. As our study goes on, we shall find that each variety of corn, as is shown in Fig. 62, has certain peculiarities in the shape of its kernels, but, even with these in mind, there are some qualities which all kernels should have.

Both the size and the shape of the kernels are important. As the entire space around the cob should be used, fairly large, deep, close-fitting kernels are to be sought. Wedge-shaped kernels, not too pointed, seem to fill up the space most snugly and with least loss. Not only should the kernels be wedge-shaped but they should be uniform in size so that the corn-planter may drop them evenly in planting. As you will see by

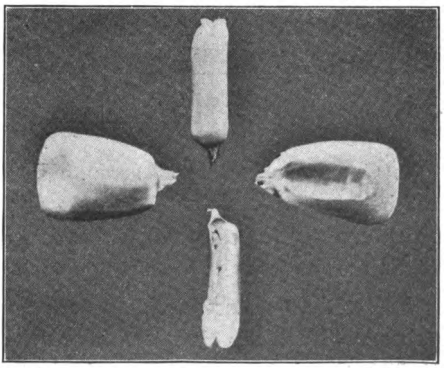


FIG. 65. KERNELS THAT WILL GROW

measuring the kernel in Fig. 64, the length of the kernel should be a little over one and one-half times the width at the widest part. The kernels should be about one half of the depth of the cob. Their thickness should be nearly the same from end to end.

The ripe kernel should have, as in Fig. 65, a clean, strong, full tip. It should have the same fresh and glossy color in front and back. It should not be discolored, blistered, wrinkled, roughened, or cracked. The germ should be large, smooth, bright, and rather horny. The germ, when cut open, should be fresh and oily in looks. Dull, dead-looking kernels have feeble life and are generally from weak stalks.

In Fig. 63 four rows of kernels are grouped for comparison. What objections can you give to the shape of the kernels in the top row? What to those in the second row? Are the grains in the third and fourth rows wedge-shaped, deep, and uniform? Are they near enough in size to be dropped evenly from the planter? Would these be good kernels for seed?

POINTS FOR THOUGHT

1. Get your teacher to arrange a debate for some evening. Let the question for debate be: "Resolved that for this community a one-eared variety of corn is better than a prolific variety." Invite the farmers to join the debaters on each side.

2. Let the teacher provide a corn show for December, invite each pupil to bring the best home-grown ear, and have three pupils act as judges and give publicly the reasons for the award. Be sure to have each pupil bring at least one ear.

CHAPTER VIII

PLACE AND MANNER OF SELECTING SEED

Now, having become familiar with the outward marks of desirable seed ears, we must decide how, when, and where we can secure such ears. As already seen, there are three ways in which to secure seed:

First, we may buy our seed from some grower who does not live near us.

Second, we may buy from some one in our own neighborhood.

Third, we may, after the first year, raise our own seed.

We have also thought over some of the objections to the first plan. However, as our success in growing corn is so dependent on planting the very best seed, we cannot spend too much time in learning how to make a wise selection of seed.

We see, in Fig. 66, an ear of a one-eared variety which is almost perfect in shape. In looks it is a model, for it has all the outward marks that are most highly prized. Its kernels are wedge-shaped, deep, and closely packed. Its furrows are close and straight. Both ends are well covered. Its cob is about the right size, and the entire ear well shaped. Maybe,

after you examine it, you are ready to say, "Such an ear is good enough for me." But do not be too hasty. Why may such a showy ear be unfit for seed?

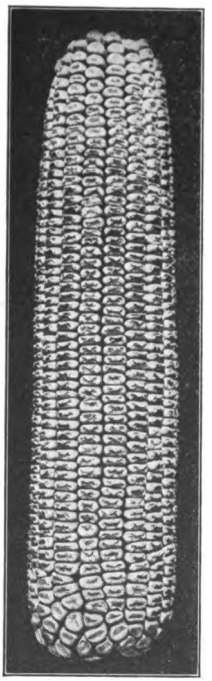


FIG. 66. HANDSOME EARS MAY DISAPPOINT YOU

First, can you from looks be sure that this ear would produce just such an ear as itself? It might do so, but on the other hand have we any such certainty, as we would have if we knew it came from a family of fine bearers? May it not be that this ear grew on a stalk that was highly favored by some accident? Perhaps the stalk that bore it stood nearly alone in the field and received an undue share of food. Perhaps, owing to the unevenness of the ground, the stalk got more than its share of moisture and fertilizer. You know that none of the qualities which a plant gets by accident is necessarily handed down to plants grown from its seed. Would it not be safer, then, not to stake your crop on looks alone, but to stake it on an equally well-shaped ear from a family that for some years had proved its worth in the field?

Second, no quality in seed corn is more to be sought after than that it should suit the soil and

climate in which it is to be grown. Can you at all tell whether this showy stranger would suit your soil and your climate? The Nebraska Experiment Station planted five varieties of prize show corn from Illinois, Iowa, and Ohio, five varieties from various parts of the state, and seven from varieties grown near the station. The showy seed from outside the state yielded thirty-nine bushels to the acre; the seed from other parts of the same state yielded forty-five bushels, and the home varieties forty-eight bushels. Can you afford to lose nine bushels an acre on your crop by securing seed from a distance?

There are objections, also, to buying from growers even in our own sections. Is such buying not more expensive than growing your own seed? Is there any way for you to find out whether the grower has become careless in selecting or caring for his seed? If his land is either poorer or richer than yours, would his seed suit your farm as well as seed bred on your own land?

Taking all these things into consideration, would it not be best for you, after the first year, to grow your own seed? Would not such growing add to the interest of your life on the farm and cause you to have a just pride in the excellence of your own seed? If you decide to follow this plan, do you not wish to understand thoroughly the methods of selecting and improving your seed? Unless you can start your crop each year with seed that has power to grow vigorously

and yield bountifully, you can never hope to be numbered among the most successful corn-growers.

By buying for your first planting well-tried seed ears from a neigboring farm, you secure parent ears that ought to give you a fine start. Then it will be

FIG. 67. CORN FROM GOOD SEED

your part to improve this seed from crop to crop. Of course, the first year you can do no more than to prepare your seed bed painstakingly and fertilize and cultivate your crop wisely and intelligently. This will give you stalks of such vigor as to bear large and heavy ears.

You are to begin your seed selection with these ears. Accordingly you must decide where and when

and how to begin your selection. In planning your first selection, keep steadily in mind just what you want. You already have ears with a fine family record. You want now to select from these ears only such as have lived up to their record. Then, after a careful comparison of your choicest ears, you want to put aside for seed only those of unusual excellence.

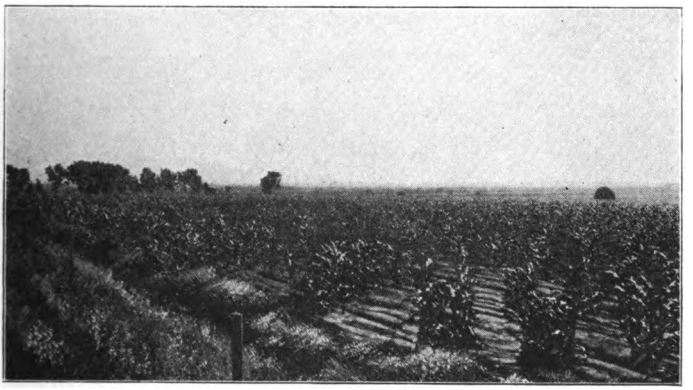


FIG. 68. CORN FROM POOR SEED

In this way you will start the second year with better seed than you had the first year. In making this comparison what sort of ears must you seek?

First, ears which were borne on vigorous, healthy, natural plants.

Second, ears from good stalks that grew under the usual conditions of the field. You do not want ears from stalks which were favored by some accident like having no neighboring stalks to share their plant

food and moisture or by some other unusual advantage. A good ear borne under hard conditions is better than a good ear from a stalk which on account of some accident was fortunate in its growth.

Third, ears from stalks that ripened their grain neither too early nor too late. Every plant needs to use for ripening its fruit all the growing-time which nature allows. If it does not do this, it is not suited to its climate and soil.

Fourth, ears from standing stalks. Usually stalks that are thrown down are less vigorous than those that hold themselves steadily on their roots.

Fifth, ears from which a heavy weight of dried kernels can be shelled.

Sixth, ears that have all the desirable markings mentioned in the last lessons.

Do you not at once see that to be guided by these rules, you must begin your selection in the field while the plants are still growing? If your choice is to be made by noting both stalk and ear, of course, you can never do this after the ears are thrown in the crib. Hence, shall you not, first of all, decide that the sure way to improve your seed is to select it in the field?

When shall you begin this selection? You will have to begin just as the corn is ripening and before the blades have lost their green, for at that time you can note the vigor or want of vigor of the entire stalk. If the stalk is undersized and spindling and

if the blades are not broad, green, and luxuriant, you will know the plant is not vigorous. You can see, also, whether the stalk grew under favorable, unfavorable, or usual field conditions. You can also note the shank and the height of the ear and whether any disease has fastened itself on either stalk or blades.

FIG. 69. FIRST FIELD SELECTION OF SEED EARS

At this time, then, make ready for your first examination in the field. Before you go to the field, however, you will have to decide how many ears you will need. You no doubt know that it takes from fifteen to twenty ears to plant an acre. Shall you, then, just multiply the number of acres you wish to plant by twenty? Not at all. You should gather at least three times as many fine ears as you will need for planting. Why? In order that you may compare

a large number of unusually promising ears and then select the very best of these. Hence you will multiply your number of acres by twenty and then multiply your result by three or perhaps, even better, by four. To secure this number of ears it will, of course, be necessary to continue examining stalks until you find enough strong stalks bearing desirable ears to give you that number.

Having, then, determined when to start your selection, you will next have to decide where or from what part of your crop you will draw your seed. Of course, you cannot examine all the stalks and ears in your fields. This would take too long. You do not wish to start just at random. What shall guide you in deciding where to begin? Think over these points:

First, you do not desire any stray pollen to get mixed with yours. Would it not, then, be best to draw your seed from stalks as far away as possible from neighboring farms? Your neighbor may not be careful about his seed.

Second, you are trying to improve your seed. Would it not help if you selected stalks and ears from a part of your crop that is somewhat better than the other parts?

Third, you are in search of seed that will suit all your land. Will you not come near finding such seed if you select from a portion of your crop that is growing on soil similar to most of your land?

After deciding on the field, or portion of field, from which to cull your seed ears, you are ready to make your first examination. With your general rules in mind, pass down the rows and scan each stalk and ear. As you will see at a glance, many are not fit for seed. As often as you come to a promising stalk and ear, like that shown in Fig. 70, stop and examine the plant closely. If it is shown by a closer examination:

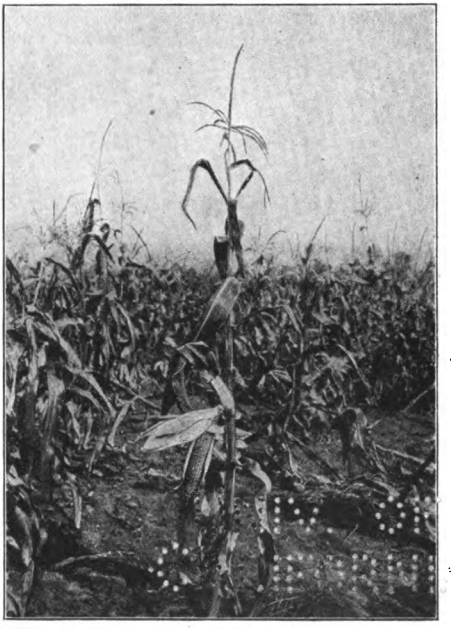


FIG. 70. A PROMISING STALK

First, that the plant is weak, not thrifty and well-shaped, reject it.

Second, that the plant may have benefited by any advantage in distance from other plants, in manure, moisture, or drainage, reject it.

Third, that the plant is ripening too early or too late, reject it.

Fourth, that the plant is not held firmly on its roots, reject it.

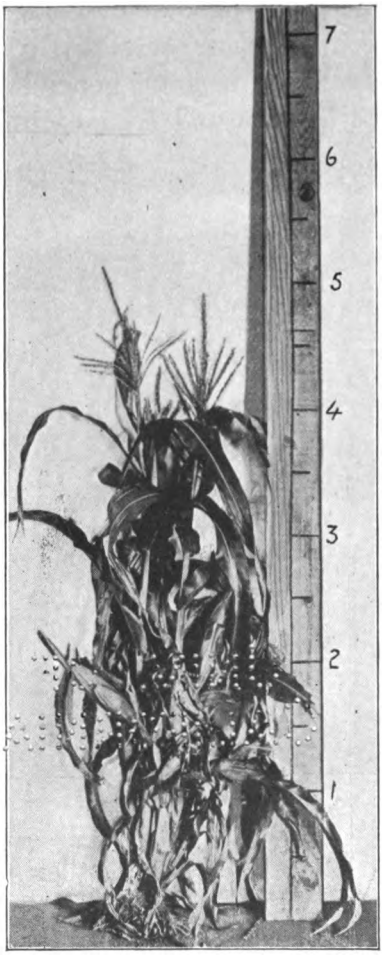


FIG. 71. TOO MANY SUCKERS

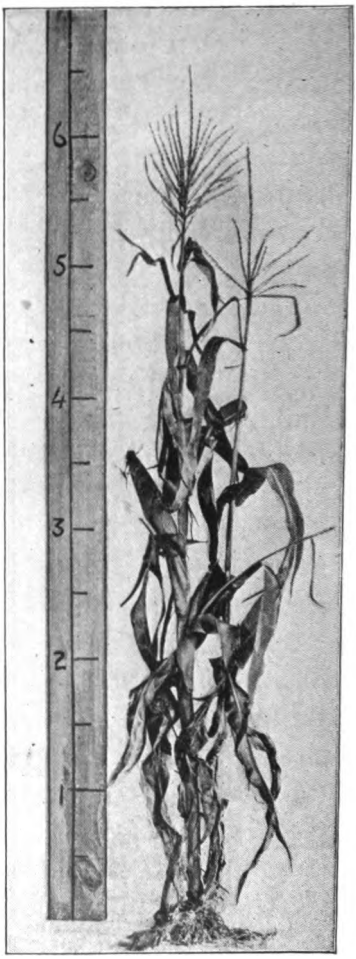


FIG. 72. EAR TOO STRAIGHT

Fifth, that the plant has too many suckers, or tillers, as the one shown in Fig. 71 has, reject it.

Sixth, that the shank is too long or weak, reject it.

Seventh, that the plant bears its ear too straight up, as the one shown in Fig. 72 does, reject it.

Eighth, that the plant is, like those in Fig. 73, bearing ears too high or too low for the climate, reject it.

Ninth, that the size of the ear is too small for the plant or the ear is too large for the size of the plant, reject it.

FIG. 73. ONE EAR TOO HIGH; ONE TOO LOW

Such plants as are not rejected by this careful examination are likely on a second and later examination to prove fit stalks from which to gather seed.

As you select the stalks mark about six times as many as you need to furnish your calculated number of seed ears. This is done by tying a string or some other label around the chosen stalks.

Just before the proper time for gathering corn, make a second examination of your marked plants. This time you will center attention on the ears. As you come to your tagged stalks, pull back the husks

FIG. 74. BOYS MAKING THEIR SECOND SELECTION

from one side of the ear as the boys are doing in Fig. 74. You want to find from this examination whether the ears have all the desired qualities already described. In addition, you wish to see whether the ears are dry and well ripened, and have the tips covered with husks. It will be prudent, too, to select only such ears as droop somewhat from the shank,

for this drooping will keep out moisture that might lead to rotting or freezing or other injury to the ear.

This second examination will probably lead you to reject about half the ears from marked stalks. This will leave you about three times as many ears as you will need for planting. Gather these ears in a bag similar to the one shown in Fig. 75. As often as your bag is filled, carry the culled ears to the end of the row. Then, if you are not going to make your final selection at the end of the row, the ears should be hung up in a protected place, in order to dry rapidly. It will be a good day's work to gather from three to five bushels of choice seed in a day. When you have plucked the finest ears from your tagged stalks, you will still have, as already noted, about three times as many ears as you will need for planting. This large number was drawn from the

FIG. 75. BAG FOR SEED EARS

field in order to allow you a final selection of the very highest type of ears for your next year's seed.

There are two places in which to make your last selection. One is at the end of the rows where you have piled your ears. If you use this method, you

FIG. 76. SELECTION AT END OF ROWS

will go from pile to pile, and from each pile, after careful comparison, you will, as shown in Fig. 76, pick out what you deem ideal ears. These you will haul to the storeroom and keep in a way to be described later. Think whether you see any objections to this method. Consider these:

First, would you be sure that the ears are dry?

Second, would not this examination have to be a hasty one? Why not take time for so interesting a task?

Third, might further drying not bring out defects or diseases not then easily seen?

The second and better method is to haul all your gathered ears to a protected storeroom. Such a room should have a fair amount of warmth and a free current of air. Be sure to place the ears so that they will not touch one another. Avoid all storing in boxes, barrels, or sacks. After the ears are completely dry, you are ready for your last selection. The time taken for drying will, of course, vary in accordance with the amount of moisture which the corn contained at gathering. Even at harvest-time ears plucked from stalks growing in rich bottom lands frequently contain much moisture. To save damage from freezing, it is often necessary, in sections which have early frosts, to gather corn when it is still full of moisture. In both of these cases much time will be needed for complete drying. As soon as the ears are dry, you are ready for your last selection.

A simple plan is to spread a number of ears on a table, as the pupils have done in Fig. 77. Then study each ear with care. Do not accept an ear unless it comes up to the high standards already described. As soon as you have chosen the best ears on the table, remove your selected ones for storage and send the others to the crib. Proceed in

this way until you have an abundant supply for seed. This work can be done on rainy days, and should be done without haste and without slackness. A few hours spent in this interesting labor will go far towards filling your cribs in the following fall.

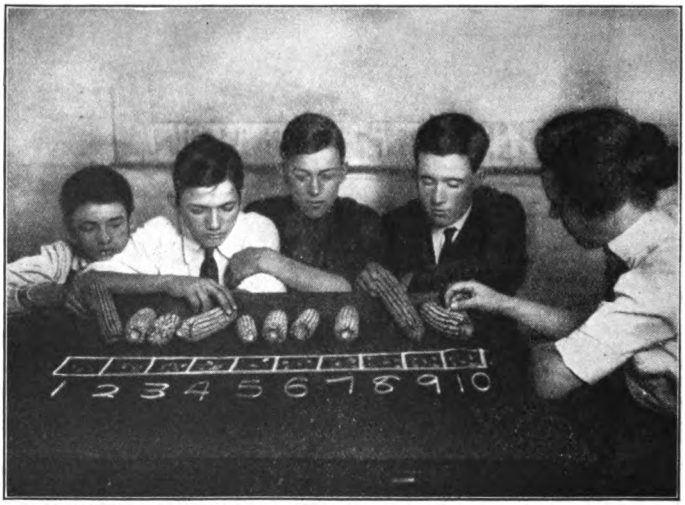


FIG. 77. SELECTING FROM STORED SEED EARS

In this study of field selection, only the one-eared varieties have so far been considered. However, if you live in a section in which experience has shown that the prolific varieties outyield the one-eared varieties and if your land is fertile enough to yield from twenty-five to thirty bushels an acre, you will do best to plant a prolific corn. In your field selection of prolific varieties, you will follow exactly the

same methods as you did with the one-eared varieties, except that you will mark and gather your seed from stalks, like the one in Fig. 78, which bore two excellent ears.

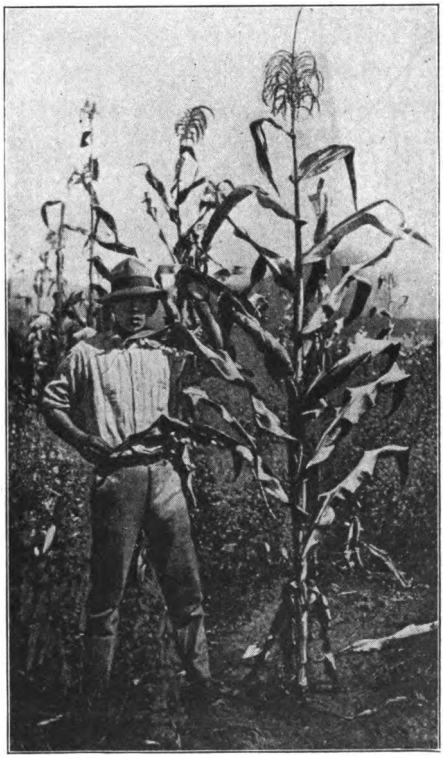


FIG. 78. SELECTING FROM A TWO-EARED STALK

If you wish to improve your seed more rapidly than you can by simple field selection, you will be greatly interested in trying the "Ear-to-the-row" breeding patch. This form of breeding is called "Ear-to-the-row," because you must plant each row from a separate ear.

For your breeding patch select one acre as far as possible from any other cornfield. The land for your patch should be like most of your other cornland. It should be level and no part of it should be richer than the other

part. It should be fertilized and cultivated in the same way in which you fertilize and cultivate your regular crop; for, as stated before, you do not want seed from plants which have been favored.

Lay the acre off in rows four feet apart. This will give you fifty-two rows, each two hundred and ten feet long. Keep the two outside rows for what are known as "guard rows." These rows are saved to catch stray pollen from other fields and to guard against the unusual hardships that outside rows often have. This will leave you fifty rows for your breeding patch. Number the rows from one to fifty.

Now, select fifty of your finest ears, and remove as unfit for seed the kernels at the butts and tips. Beginning with row No. 2 plant by hand fifty rows. Be sure to use a separate ear for each row. Never put in any of your fifty rows any seed left from any other ear. With what seed is left, plant your two guard rows. In all the rows let the stalks stand eighteen inches apart, and, after the plants are from eight to ten inches high, thin to one stalk in each hill. If, however, you prefer the check-row plan of planting, drop four kernels to the check and then thin to three plants in the hill.

In the fall, examine the rows, and mark the best stalks of the best rows. Gather the ears from each row separately, and preserve carefully apart the ears marked from the best stalks. Now weigh the ears from each row. The total weight of corn from each

row will show which are the high yielding rows and which are the light bearers. From the rows which gave the highest weight, save the ears marked as coming from the best stalks. Then tag these ears with

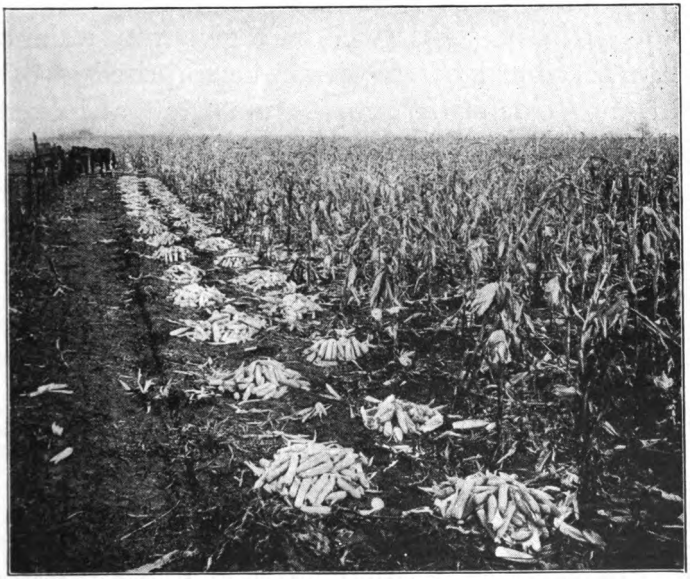


FIG. 79. YIELDS FROM EAR-TO-ROW PATCH

the number of the row from which they came, and save them for your next year's breeding patch. The other best ears from high yielding rows will be used to plant your crop for the coming season. The ears from the low yielding rows will be thrown into the crib.

In the second year the ears chosen as the best will, in the same way as before, be planted in the

breeding patch. In this way both the high yielding ears and the light yielding ears can be found. By throwing out the light yielders each year, and planting only from those rows that prove themselves most fruitful yielders, you can produce and keep up a strain of corn which will give you a high return for your labor. You will be surprised at the different yields of the rows. From ears that looked equally good, yields that vary as much as 50 or 100 per cent are often produced.

POINTS FOR THOUGHT

1. How far should looks count in an ear of corn?

2. How many stalks should you tag in order to provide seed for forty ears?

3. A fine stalk in your field grew from the spot on which a stack of clover hay remained for some time. Would you select seed from the ear on this stalk?

4. Give two reasons for not selecting seed from stalks growing at the very end of your rows.

5. To secure a proper rotation of crops it is often necessary to plant some of your corn rather late. As a rule, would you not avoid selecting seed from such late corn?

6. One of your neighbors who does not select his seed in the field advertises that he has for sale ears that will produce a heavy yield of shelled corn to the ear. Give three reasons why you would not buy such seed.

7. In looking over your cornfields you find some excellent stalks growing on the only hillside on your farm of two hundred acres. State why you would not mark these stalks for seed.

CHAPTER IX

STORING THE SEED

After you have thus painstakingly and thoughtfully selected your next year's seed, must you not make sure that these valuable ears are properly preserved until planting time? Many a fine ear is injured or ruined by careless storage. We must always keep in mind that stored in each kernel there is a tender, living plant — the germ. This may be injured easily and its life or vigor ended. It is the grower's task to keep all harm from this tiny germ on which his hopes of an abundant harvest depend. What are some of the foes of the germ?

First, an ill-suited storage room. The life and the vigor of the germ depend largely on protection from too much moisture. Ears that are meant for seed should be as dry, when they are gathered, as field conditions will permit. Then they should be kept dry. If the ears are stored in a damp, very warm room, mold is likely to form and injure the germ. Therefore, for the first two months after gathering, the ears should be put in a dry room through which enough air to carry away moisture is constantly passing. The temperature of the room should never be allowed to fall below the freezing

point. If the weather should happen to be wet at storage time, put the ears in a room sufficiently warmed to drive out the moisture. It is, however, safer for corn to be air-dried rather than fire-dried.

Second, freezing. As long as there is much moisture in the ears, they should never be stored where there is danger of freezing. The freezing of the moisture around the germ will kill it. After corn is thoroughly dried, there is little danger from storage in a freezing temperature, but it is safer never to run this risk; for the corn, after its first drying out, may again take up moisture.

Third, late gathering. The longer corn stays in the field the longer, of course, the seed ears are beaten by rain. No ears set apart for seed should stay in the field long enough to be caught by a hard freeze. Experience proves that early gathering keeps vigor in the germ.

Fourth, direct sunlight. While a well-lighted room is desirable for the ears, they should be so placed in the room that the direct rays of the sun cannot fall on them.

Fifth, contact. Seed ears ought never to be stored so that they can touch one another. Such touching helps to keep moisture in the kernels and increases the danger of killing the germ by mold and rot.

Sixth, rats and mice. Of course, seed must always be stored so that it cannot be injured by rats and mice.

APPLYING THE LESSON

1. In his anxiety to prevent his seed from freezing a young grower closed all the doors and windows of the storage room into which he had put his freshly gathered ears. If he kept these closed, what injury would be done his seed?

2. Corn when first gathered contains about 25 per cent of moisture. After some weeks of drying it contains only 10 per cent. What per cent of the original moisture did it lose?

3. Explain the possible danger of storing corn in a cellar. Would the kitchen be a good storage room? Animals breathe out a good deal of moisture. Would it be well to store corn in a loft over a stable? Experiments show that corn stored in attics usually has healthy germs. Can you give reasons for this?

4. On a damp day would you open or close the windows of a seed storage-room?

5. If your seed corn is in the field and a cold wave is predicted, what would you do?

Some seedsmen or other large growers who must save large quantities of seed build storage houses for it. These houses are provided with wire racks, slatted shelves, or other arrangements for holding the ears so that air may pass freely around them. Most of these houses are furnished with stoves or furnaces to dry the corn when it is first stored and to keep the rooms fairly warm in very severe weather. However, unless a grower has unusually large quantities of seed to store, the cheaper methods given below will keep the seed as safely as though a house were built and warmed for them.

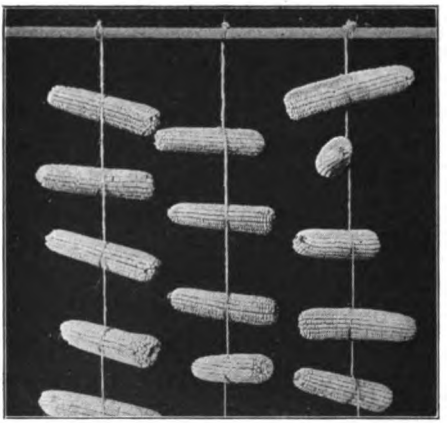


FIG. 80. EARS HUNG FROM A POLE

There are several simple ways of keeping safe the seed ears. One of the most convenient is shown in Fig. 80. You notice that the ears are fastened by strong strings to a hanging pole; that each ear is hung so as not to touch any other ear; that air reaches all the ears.

A second method is known as the "two-string" or "seesaw" plan. Fig. 81 shows clearly how one ear follows the other with a string at each end. The two pieces of string keep the ears from touching and permit air to sweep around the ears. This plan has an advantage over the first plan in providing for more ears in a small space. After ten or twelve ears are "seesawed" in, the tops of the string are fastened to a nail.

FIG. 81. THE "SEESAW" METHOD

In order that one man may string the ears, a shuttle device (see Fig. 82) was invented to push the strings backward and forward as the ears are pushed in.

FIG. 82. STRINGING DEVICE

A third plan is known as the wooden-slat method. As you see from Fig. 83, wooden slats are nailed on each side of two posts. This makes an airy shelf and takes up very little room.

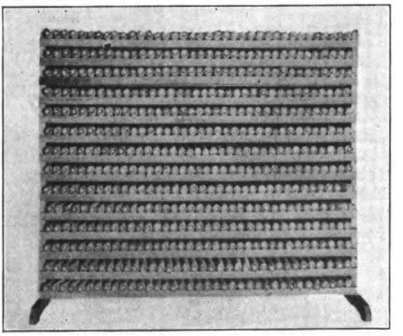


FIG. 83. WOODEN-SLAT METHOD

According to a fourth plan nails without heads hold the ears. The nails may be driven into a pole supported as shown in Fig. 84, or into a plank to which a string is fastened to hang the plank out of the way. This plan is illustrated in Fig. 85. Be sure that the nails are sufficiently far apart to hold the ears without their touching. A large "corn tree," as this sort of frame is called, will hold conveniently

from two to three bushels of seed ears, which will be enough to plant from fifteen to twenty acres.

Still a fifth plan is a wire rack cut from welded wire fencing. This method is shown in Fig. 86. In the United States over a hundred million acres are planted in corn each year. Every one of these acres

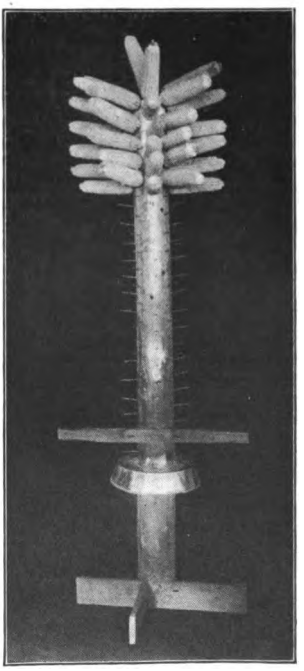


FIG. 84. A CORN TREE

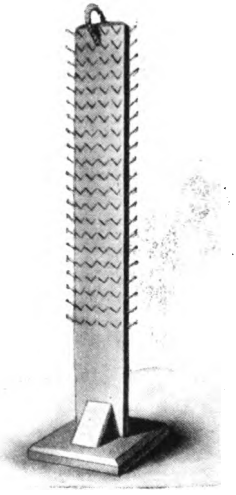


FIG. 85. A HANGING CORN TREE

would yield several bushels more if it were seeded with selected, early-gathered, well-dried, and carefully stored ears. The planting of weak, damaged, or dead seeds causes an annual loss of millions of dollars. This loss can easily be prevented. Surely

every grower wishes to know how, by simple devices, to save his country from so enormous a loss.

To sum up, there are two ways to insure good seed and thus save so many lost bushels. Each of these ways requires a little extra work in the fall and in the spring. The added work in the fall will be to select your seed in the field and to gather it early before it is damaged by rain, cold, or disease, and then to store it wisely. . There will usually be little failure to sprout or to yield when fields are planted with selected seed ears which have been, first, produced by excellent home-grown parents; second, gathered soon after they ripened; third, dried carefully and thoroughly; fourth, stored securely until planting-time.

FIG. 86. A WIRE SEED RACK

What is the spring task that will call for some painstaking but delightful labor? It is to test each of these treasured seed ears in order to remove all doubt whether it has power to germinate and to make

a healthful growth. In no other way than by testing can you be sure that your seed will germinate.

POINTS FOR THOUGHT

1. Why should you never store your seed corn in the husks?

2. A farmer who stored his seed ears in boxes found in the spring that with a fine season and good seed he had a very poor stand of young plants. Can you explain to him why this was so?

FIG. 87. ARRANGING THE EARS

3. In what month is a freezing spell most likely to injure seed ears?

4. Can you think of some reasons why air-drying is better for seed ears than fire-drying?

5. Why should you protect seed ears from late-ripening varieties of corn more carefully than ears from early-ripening kinds?

CHAPTER X[1]

HOW TO TEST SEED CORN

The sawdust plan of testing the power of seed to germinate is practiced on thousands of farms every season. Men are learning that they cannot afford to plant an ear of corn without knowing that it will grow. The test is simple and can be made by almost any intelligent child. The steps outlined below and the illustrations show how the selected ears are tested.

1. *Arranging the ears* (*Fig. 87*). Put the ears side by side on a table, planks, or anything that may be convenient for the purpose.

2. *Picking out the weak and poor ears* (*Fig. 88*). After the ears are placed on the table study each carefully. Time and work can be saved by throwing out any ears that appear weak before a germination test is made. Ask the following questions as you examine each ear:

a. Will it yield? that is, will it produce a profitable crop in my vicinity? Has it vigor and hardiness? Among the things that show good yielding qualities are proper size and shape of ear, firmness and weight of ear, depth of kernel, size of germ, well-filled tip and butt.

b. Will it ripen? that is, will it mature on my farm this year and its seed every year thereafter? Lack of maturing power is shown by an ear if it is too large and if its kernels

[1] This chapter is adapted from "Seed Corn" by the courteous permission of the authors, Professors P. G. Holden and J. E. Waggoner.

are chaffy, light of weight, loose on the cob, and of a dull, starchy appearance.

c. Will it grow? that is, is each kernel clear, bright, smooth, and horny, with a large germ, or heart? When the

FIG. 88. THROWING OUT POOR EARS

germs are dull-colored, cheesy in appearance, or of a dark color, the ear should be thrown out. On the other hand, white, brittle germs show strength.

d. Does it show improvement? that is, from appearance does the ear indicate that there have been men of brains in charge of its improvement and that they have spent years in carefully selecting its parents? Does the ear resemble

such ears as uniformly reproduce themselves in type, in time of maturity, in size and shape of ear and kernel?

Ears that are to be rejected should be carried to the feed bin or corn crib, in order that you may avoid any possible chance of getting them mixed with the seed corn by mistake.

FIG. 89. EXAMINING THE REMAINING EARS

3. *Inspecting the kernels of each ear* (*Fig. 89*). After the choicest ears appear to have been selected, the next step is to inspect carefully the kernels of each of these ears. Take two or three kernels from each ear, about a third of the length of the ear from the butt; lay them germ side up at the tip end of the ear from which they were taken. If the kernels are small, narrow, shallow, too deep, or show immaturity, starchiness, tendency to

mold, or if the germs are small, shriveled, blistered, weak, or frozen, the ears should be rejected.

The work of throwing out the poor ears — those that from their appearance are unfit for seed — is easily done. Has this inspection, however, made it sure that the remaining

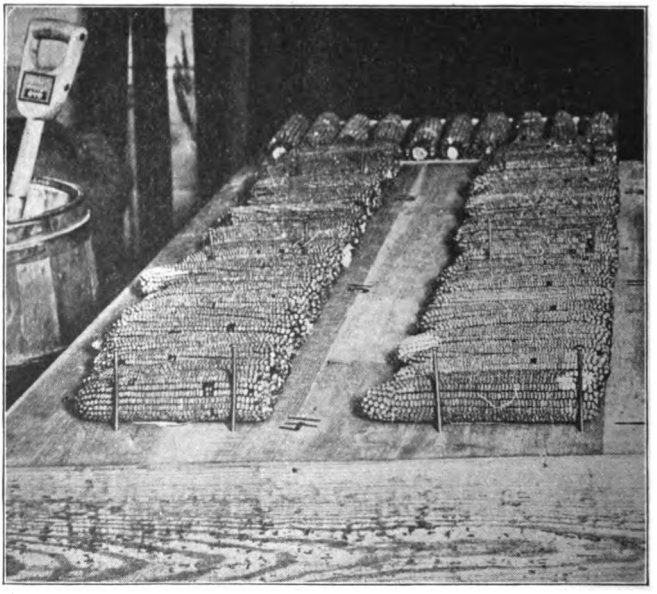


FIG. 90. LAYING OUT EARS BY TENS

ears will sprout and grow? Not at all; no one can tell from such an inspection that the kernels of these ears are certain to grow. We shall have to test kernels from each ear to obtain such certainty. The following steps show how this is done:

4. *Numbering the ears* (*Fig. 90*). Lay out the ears in rows and separate into groups of ten each, as shown above. It will not be necessary to number all the ears, but only those

on the right of the nails, as shown in Fig. 90. The numbers will read, 1, 11, 21, and so on for each row.

5. *Preparing sawdust* (*Fig. 91*). The sawdust to be used in making the test should be put in a gunny sack and soaked

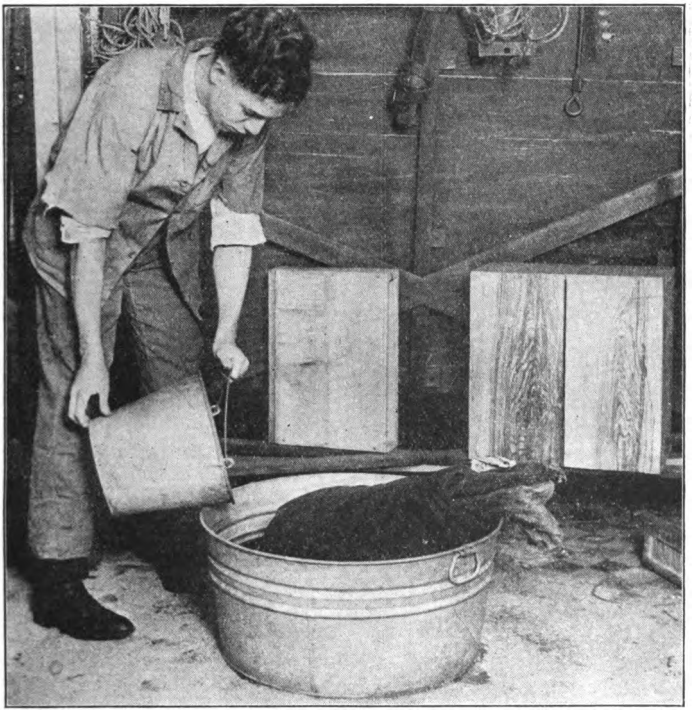


FIG. 91. PREPARING SAWDUST

in warm water at least an hour or, better still, overnight. While thus soaking the sawdust it should be well covered with water, as shown in Fig. 92. If new sawdust is used, be sure to soak it at least one night.

In most sections sawdust can be obtained from ice houses, sawmills, lumberyards, meat markets, or elsewhere.

6. *Removing excess water* (*Fig. 93*). This figure shows a method of removing the excess water from the sawdust. Too much water will make the sawdust cold and soggy, and that would make the germination slower. Treading is also a good way to remove the excess water.

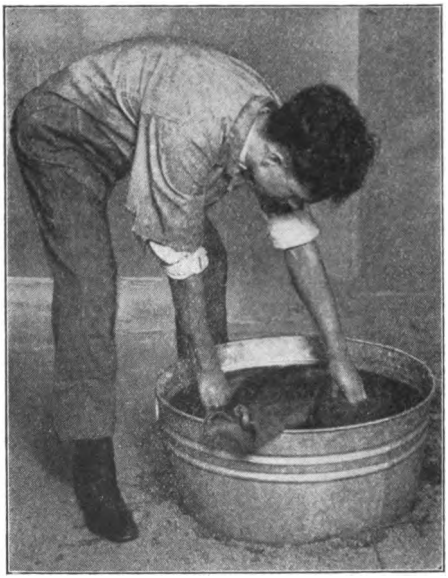


FIG. 92. COVERING SAWDUST WITH WATER

7. *Preparing the germination box* (*Figs. 94 and 95*). Any ordinary shallow wooden box can be used as a germination box. After selecting a box, fill it about half full of the warm, well-soaked sawdust and pack it down firmly with a brick. The top of the sawdust should be even and level.

The germination cloth should now be put in the box and tucked in carefully around the edges. Notice that there is a margin of $2\frac{1}{2}$ inches around the edge of the cloth and that the squares are $2\frac{1}{2}$ by $2\frac{1}{2}$ inches. The germination box should be 30 by 30 inches and 4 inches deep. The box can be saved from year to year. This box is large enough to test 100 ears of corn.

8. *Removing kernels for germination box* (*Fig. 96*). Remove six kernels from six different places in ear 1 and place them in a square of the box and mark it 1. In removing kernels take two from near the butt on opposite sides of the ear, two from the middle, and two from near the tip. In drawing these kernels turn the ear so as not to take two kernels out of the same row. Do the same with all the ears until the germination box is full and each square is numbered.

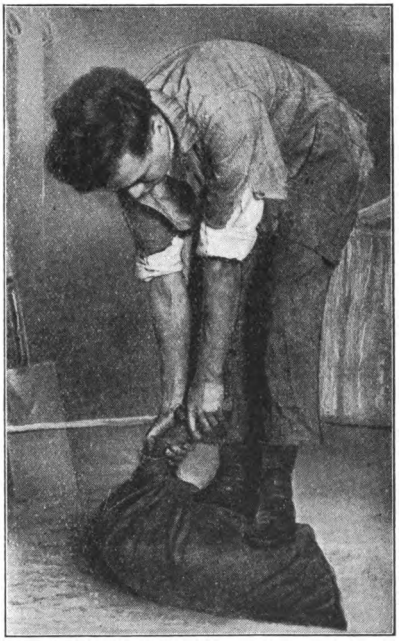


FIG. 93. REMOVING EXCESS WATER

9. *Placing the kernels in the box* (*Fig. 97*). The kernels should be laid in the squares with the tips all one way and the germ side up. Care in placing the kernels will assist very much in reading the tests later.

10. *Laying on the cover cloth* (*Fig. 98*). As soon as the kernels are all carefully arranged the box is ready for the cover cloth. Remember to dip the cover cloth in warm water and wring it out before placing it over the kernels. Place the cover cloth without disturbing the position of the kernels. This cloth helps to keep the kernels in place and should always be used.

11. *Laying on the top cloth* (*Fig. 99*). The top cloth fits just over the cover cloth. It should be several inches larger than the germination box, so that it may be folded over the top after it has received the sawdust.

12. *Packing sawdust* (*Fig. 100*). The space in the box above the cover cloth should now be filled with warm sawdust,

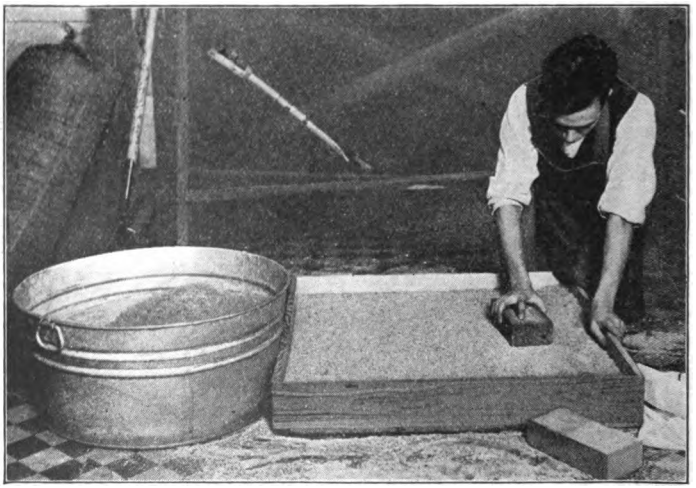


FIG. 94. PREPARING GERMINATION BOX

packed down carefully, either as shown in Fig. 100 or with a brick as in Fig. 94. The brick is usually preferable.

13. *Covering the box* (*Fig. 101*). This shows how the top cloth should be folded in over the edges of the germination box.

14. *Raising side of box* (*Fig. 102*). The side of the box toward which the crowns of the kernels are pointed should be raised. If this is done the kernels, when germinating, will follow the laws of nature and send the stems toward

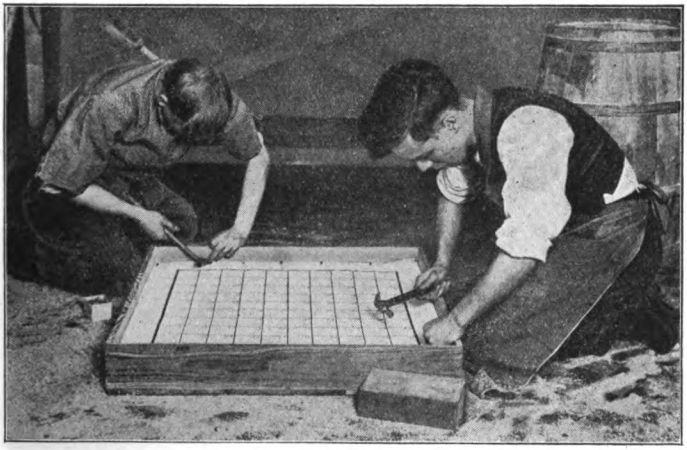


FIG. 95. PUTTING GERMINATION CLOTH IN BOX

FIG. 96. REMOVING KERNELS FOR GERMINATION BOX

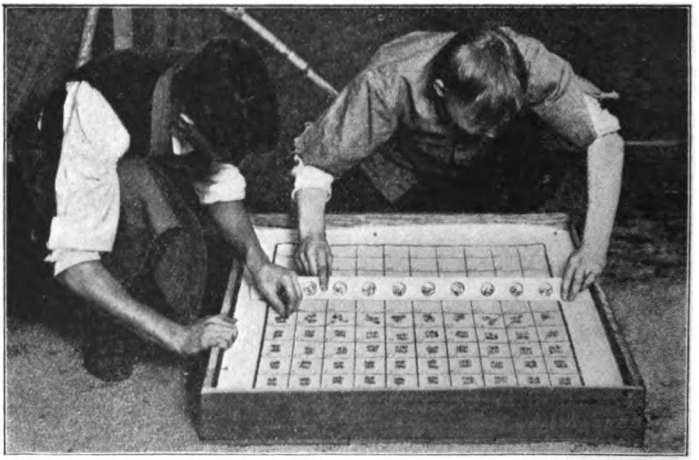


FIG. 97. PLACING KERNELS IN THE SQUARES

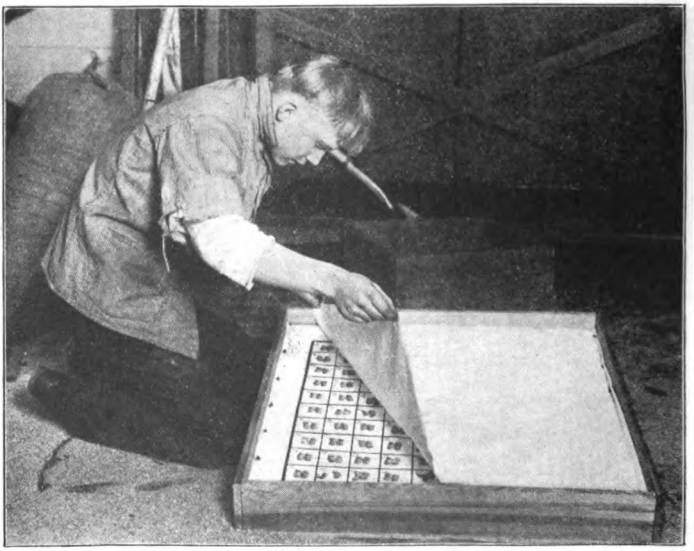


FIG. 98. LAYING ON COVER CLOTH

the upper part of the box, and the roots will go downward. This arrangement of stems and roots will be a great help in reading the final test which shows the ears that are fit for seed.

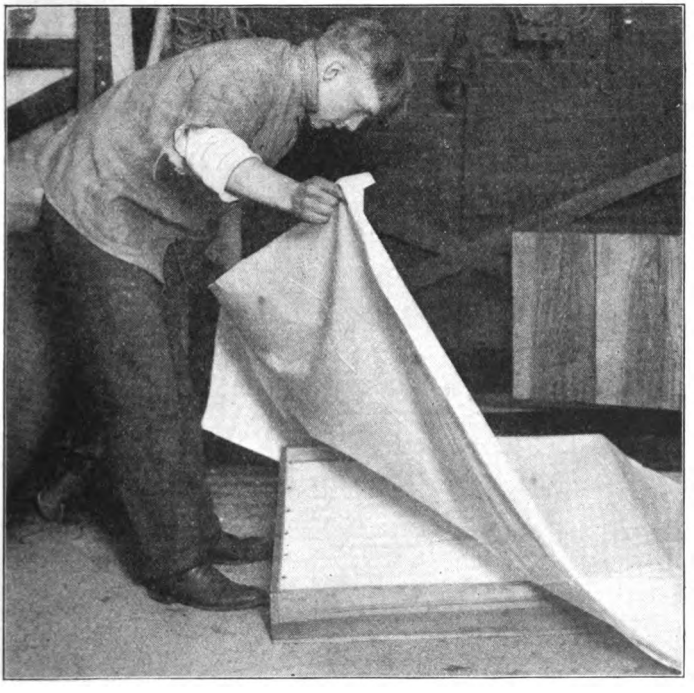


FIG. 99. LAYING ON TOP CLOTH

15. *Waiting for seed to germinate* (*Fig. 103*). The figure shows a convenient arrangement for holding the ears in place until the germination test is ready to read. It is simply to place a board over the rows to keep the ears in place. It usually takes from seven to eight days for corn to germinate well. When several tests are to be made, the boxes may, for

convenience of storing, be placed on top of one another. The boxes should now be put away in an ordinary living room, cellar with furnace, or some other warm place.

16. *Removing the top cloth* (*Figs. 104 and 105*). To find whether the kernels are ready for examination remove the top cloth, including the sawdust.

FIG. 100. PACKING THE WARM SAWDUST

The top cloth should always be removed carefully so as not to displace any of the kernels. When the sprouts are about two inches long it is time to read the tests.

17. *Reading the test* (*Fig. 106*). The test shows what kernels are either weak or dead. The weak or dead ears from which these kernels came should be put in the feed bin. The ears whose kernels show from medium to strong sprouts and the ones that were slow in starting to sprout should be put together and carefully labeled to prevent any mistakes in the future. The ears from which these kernels were plucked should be used only in case there is a shortage of seed corn. They should be tested again before they are used as seed.

18. *A section of a germination box* (*Fig. 107*). For the reasons given below, ears 2, 11, 12, and 24 should be

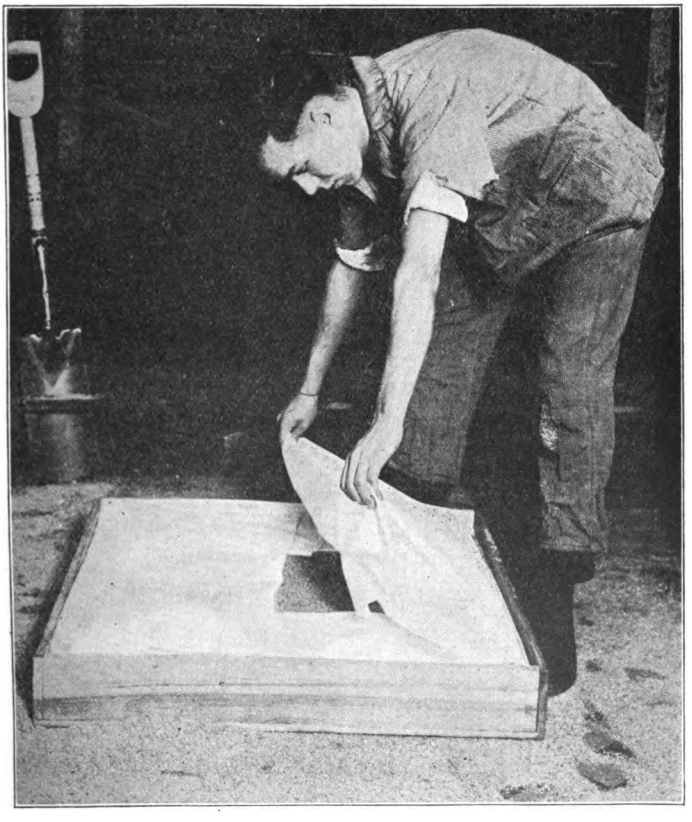


FIG. 101. COVERING THE TESTER

immediately removed and carried to the feed bin for fear they may get mixed with the others by mistake. The kernels of ear 2 are weak. One kernel has not sprouted at all, only

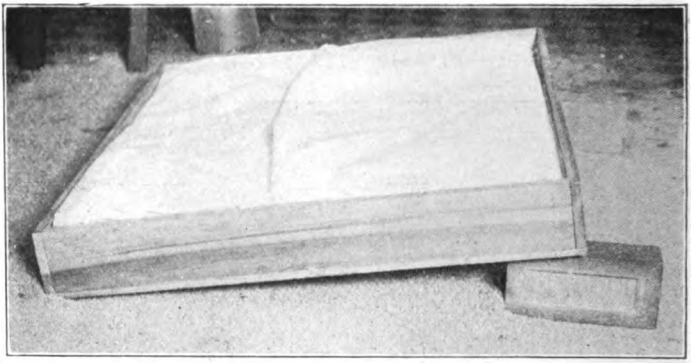


FIG. 102. RAISING ONE SIDE OF THE BOX

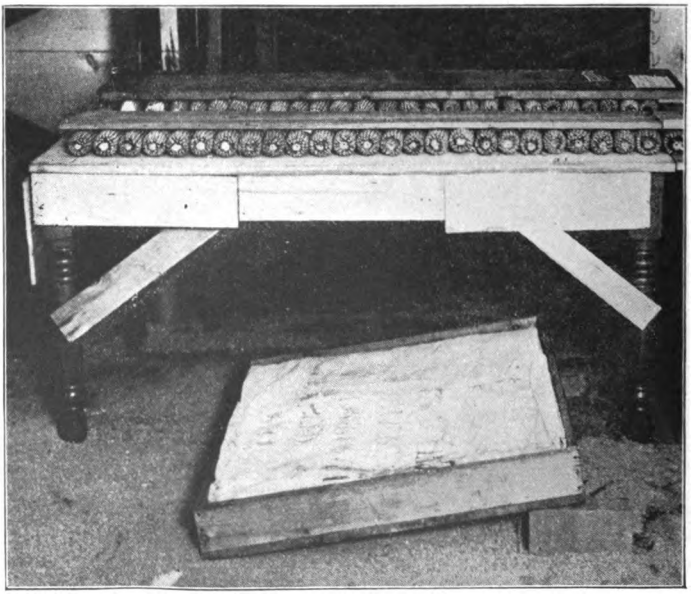


FIG. 103. WAITING FOR SEED TO GERMINATE

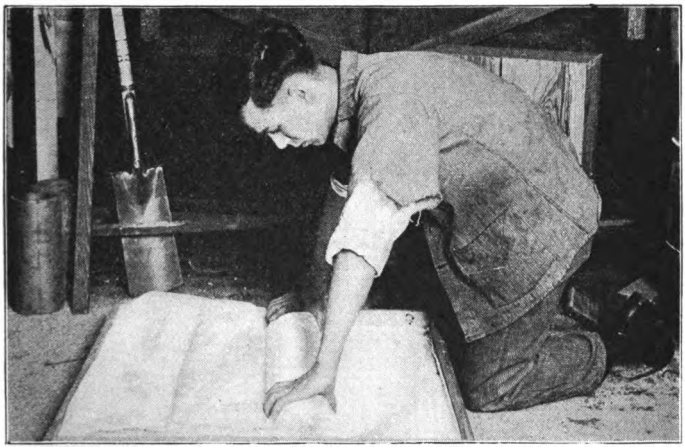


FIG. 104. REMOVING TOP CLOTH

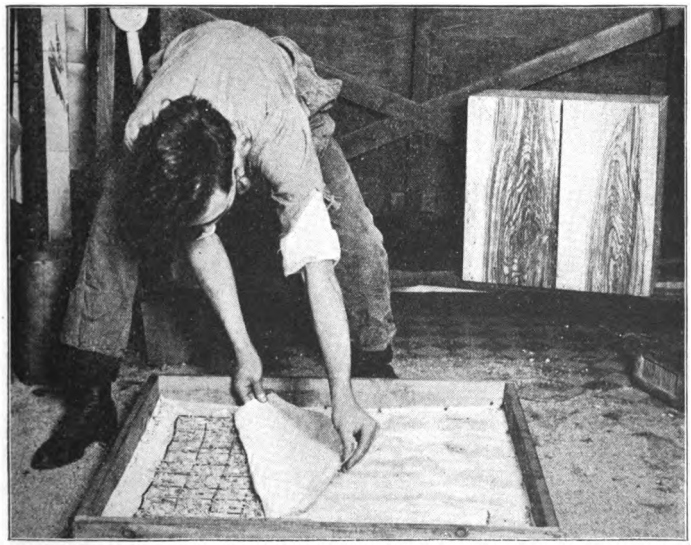


FIG. 105. REMOVING THE COVER CLOTH

FIG. 106. READING THE TEST

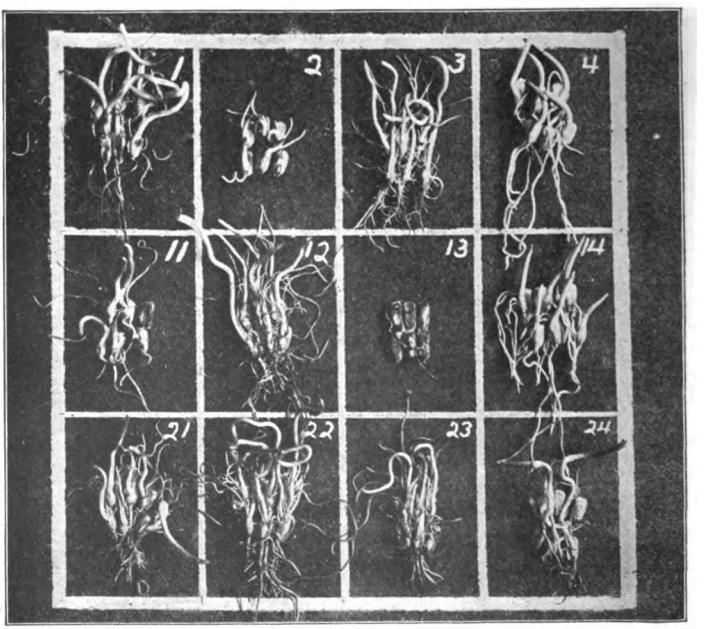


FIG. 107. SECTION OF GERMINATION BOX

swollen a little. The kernels of ear 11 show one dead and one weak kernel; ear 13 has six dead kernels; ear 24, three dead kernels. The kernels from ears 21 and 23 are weak and slow in sprouting and should be put to one side and not used unless necessary. The kernels from ears 1, 3, 4, 12,

FIG. 108. SHELLING THE CORN

14, and 22 show vigorous sprouts. Ears like 2, which show some life, if planted will produce plants that will grow slowly all summer and probably produce little or no grain.

Many experiments have proved that weak ears, like 2, when planted beside strong ears, like 22, produce only about half as much corn. The results of thousands of tests show that there is often from 15 to 60 bushels less yield from weak seed than from strong. There is no doubt that testing pays. Test every ear. Do not guess.

19. *Butting and tipping.* After removing the weak and dead ears, and selecting ears for the breeding plat from which to obtain next year's seed corn, butt and tip the remaining ears. You are now sure that they are excellent seed ears.

20. *Shelling the corn* (*Fig. 108*). Each ear should be shelled by itself and its kernels carefully examined. Are the

FIG. 109. HANGING UP CORN FROM THE BEST EARS

kernels well shaped? Do they carry their size well down to the tip? Have they a clear, clean color, and a bright, healthy, horny appearance? If they do not possess these qualities, the ears from which they were drawn should be thrown into the feed bin. On the other hand, if the kernels are large and the quality is good, put them in the box marked "First grade — large size." If the kernels are only second rate in quality, they should be marked "Second grade — large size." The small-sized kernels should be treated in the same way. Seed from the first grade should be planted first.

Do not use the second grade unless necessary. Careful attention to grading each ear after it has been shelled will help in deciding what plates to use in the planter in order to secure a uniform, regular dropping.

21. *Caring for seed until planting-time* (*Fig. 109*). After the seed has been sorted, tested, shelled, and graded for the planter, it should be sacked, a half bushel in each sack, and hung up in a dry place where it will not freeze. Either a dry, well-ventilated attic, or basement with a furnace is a good place for hanging the seed.

Notice especially the white sacks on the left bearing the label "Seed from the 100 Best Ears." It is a good plan to put the best seed into white sacks to distinguish them from the general supply of seed, which, it will be noticed, has been put into gunny sacks.

Be sure in planting to use the best seed first. Plant this seed on one side of the field and from it pick your seed corn for next year's planting.

CHAPTER XI

SOIL FOR CORN

Ready now with choice seed, you must decide in what sort of soil to plant this seed. There are, as you perhaps already know, many kinds of soil. You do not care to waste your selected seed on land unfit for corn. What type of soil must you choose?

One of the reasons why corn is king among the grains is that it thrives on so wide a variety of soils. Some of the highest yields have been made on different kinds of soil. Dr. Z. V. Drake of Marlborough County, South Carolina, grew 239 bushels on an acre of sandy land. So well had this originally poor acre of sandy land been prepared for corn that Dr. Drake had to set posts and tack strips along his rows to hold the crowding plants in place. Charles Parker, a Hertford County, North Carolina, boy, produced 213 bushels on an acre of sandy loam. E. S. Fursman of Woodford County, Illinois, found that he could grow 160 bushels on one acre of the usual type of prairie soil. Mr. Alfred Rose of Penn Yan, New York, coaxed an acre of clay land to yield 199 bushels.

These examples prove that any well-drained soil which has a fair supply of humus in it will, with good seed, careful cultivation, skillful fertilizing, and

sufficient rain, produce a paying corn crop. If, however, you are so fortunate as to have a choice of soils, select a deeply drained, finely grained, black, brown, red, or sandy loam for your corn.

Let us take, for example, a boy who has decided to enter the next year's contest for the highest yield of

FIG. 110. CHARLES PARKER AND HIS TWO HUNDRED AND THIRTEEN BUSHELS OF CORN FROM ONE ACRE

corn on one acre. His father offers him the choice of any acre on his farm, but for some reason prefers his taking a field already planted in corn. Would it not be wise for the boy to go over the farm while the present crop is growing? Would this not show him what soil might be counted on for a high yield provided he did his part? Would it not also show what land to avoid?

Suppose he went first to a field like the one pictured in Fig. 111. What would these spindling stalks, narrow leaves, and vacant hills tell him about the soil? Would there be much chance to make such soil rich in one year? Should not the boy decide against such an acre? Have you ever noticed how some farmers plant corn in fields which, like this one, have already proved themselves too poor to grow a paying crop? What, instead of corn, ought to be planted in such a field?

Suppose the boy in search of a good acre went next to such a field as is pictured in Fig. 112. Notice that there is some good corn in this field. What effect, however, would the barren spots have? Could the boy hope to get a high yield if he lost a part of his acre on account of such spots? Would it not be hard for him to equal the yield of a boy who was using land without such spots? If the boy knew a year ahead that he would be obliged to grow his crop on such land, could he have made these eye-sores fertile? Until he could improve all these spots, would it not be best for him to select his acre elsewhere?

Next, suppose the boy, with his eyes still open, came to a field like the one in Fig. 113. What would the swamp grass on the left and in the center of the picture tell him about such spots? Would not these also cut down his yield? Could he afford to select an acre from a field with such places in it?

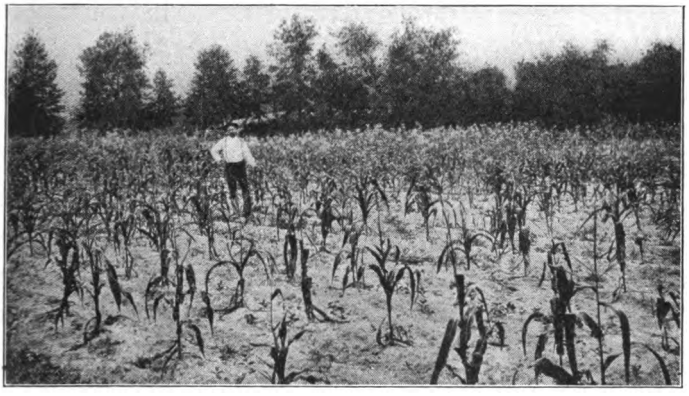


FIG. 111. SOIL TOO POOR FOR CORN

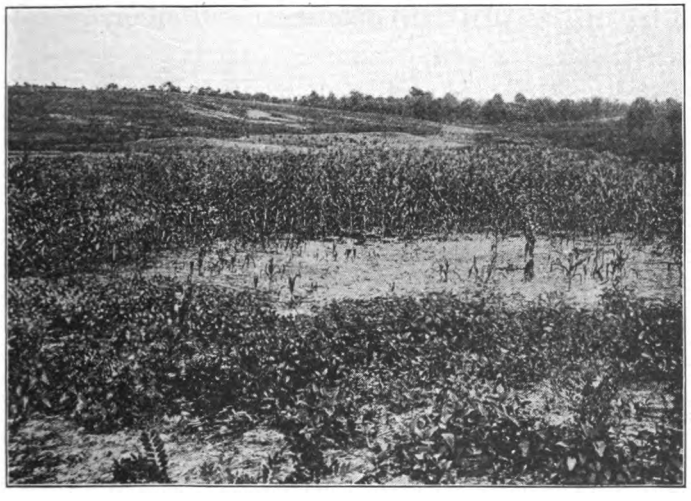


FIG. 112. BARREN SPOTS CUT DOWN YIELD

Would it be easier to get rid of these barren spots than of those in the other field?

Let us follow the boy to still another field. Do you see any reason why he should not select an acre from such a field as is set before you in Fig. 114? Look at the rows alongside the woods. Would not such rows bring down the boy's yield if he chose an acre too near a forest? The soil on which these rows are growing is as fertile as the other soil in the field. What kept these rows from getting plant food? Did the trees steal from them? The corn at a distance from the trees is excellent. If the boy can find no better field than this one, where should he lay off his plat? Should seed and labor ever be wasted on rows next to woods?

Still hoping to find a field near his ideal, the young seeker comes to a field similar to the one shown in Fig. 115. Do you not agree with him that while the corn is fairly good, weeds are thick? Will not the soil next year be even more full of weeds? Would this not make the boy labor harder to keep his crop clean? If the season should be wet, could he keep the weeds down? Would you select an acre from such a field?

In Fig. 116 you see that the boy has found a more promising field than any yet examined. Are there any weeds in sight? Are there any scalded or undrained spots? Are there any woods close by? Does not the level land lead you to think that there

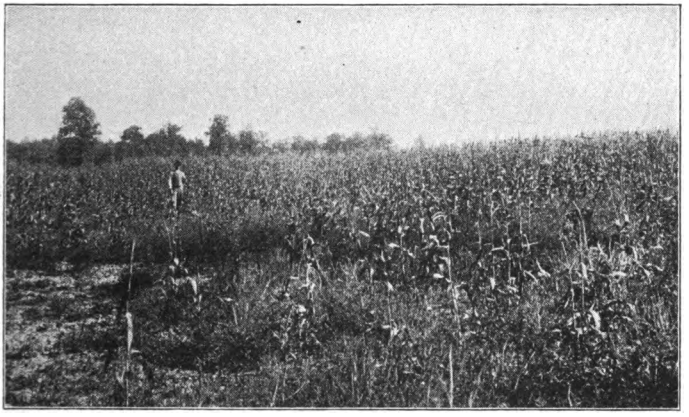


FIG. 113. SOIL TOO WET IN SPOTS

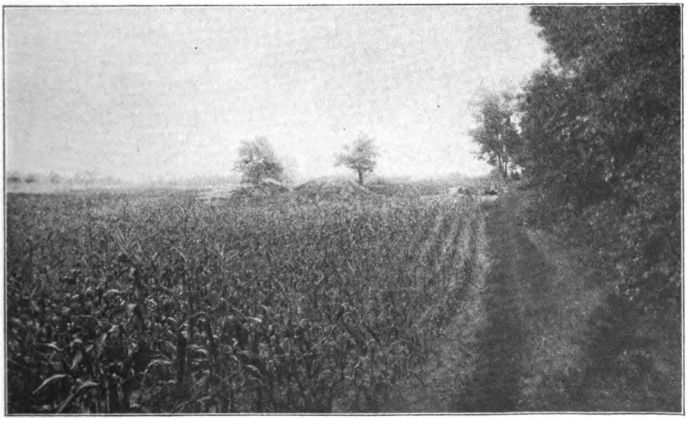


FIG. 114. YIELD CUT DOWN BY TREES

FIG. 115. WEEDS REDUCE YIELDS

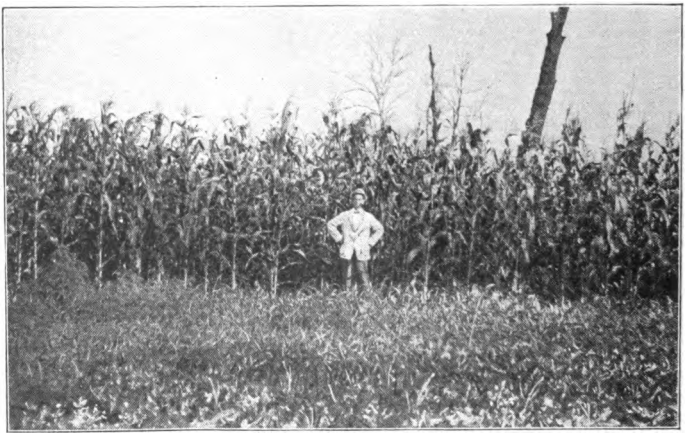


FIG. 116. A GOOD CROP BUT NO THOUGHT FOR NEXT YEAR

FIG. 117. A GOOD CROP OF CORN WITH NEXT YEAR IN MIND

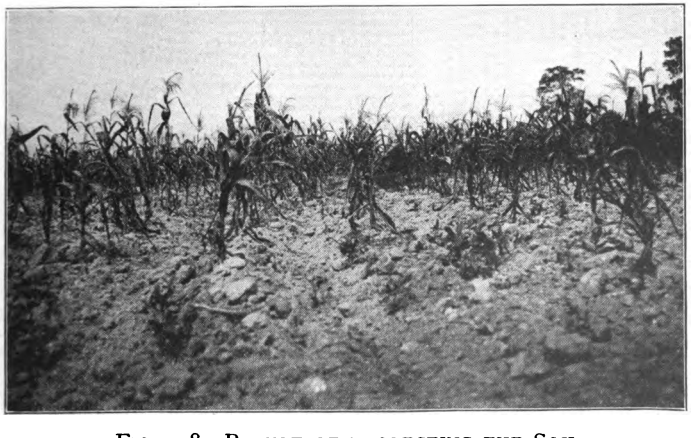


FIG. 118. RESULT OF NEGLECTING THE SOIL

will be no washing away of costly plant food? Does not the luxuriant growth of stalks convince you that the soil is rich? Do you find any crop between the rows?

Just as the boy is about to decide on this field his eyes fall on a field in front of him. Such a field is pictured in Fig. 117. Do you find that this field has all the good qualities of the field in which the boy is standing? Do not fail to note the cowpeas growing in this field. Bearing in mind that cowpeas enrich soil, would this field have an advantage over the other? If it is just as good in all other qualities would the boy be right in taking the last field? Would you select it?

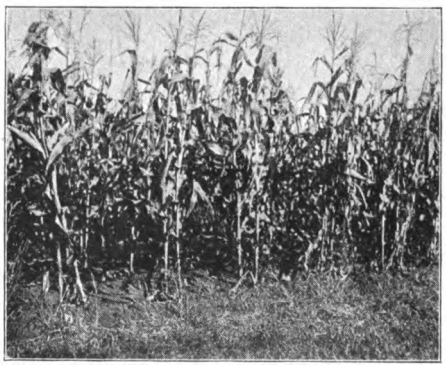


FIG. 119. THIS CROP SHOWS SKILLFUL HANDLING OF THE SOIL

If a young farmer is bent on raising high-yielding corn crops, will he not have to keep his land free from the drawbacks just considered? Compare the field in Fig. 118 with the fields in Figs. 117 and 119. Carelessness and ignorance have caused the soil in the first field to lose its power. Skill and knowledge have kept the latter fields full of plant food.

POINTS FOR THOUGHT

1. Does every tree in a cornfield reduce the yield of the field?

2. What would be a thoughtful thing to do with the land near a piece of woods?

3. Before you try to get rid of a barren spot what ought you to try to find out?

4. If a boy lost one hundred and twenty-five ears for each barren spot in his acre, and he had four such spots, how many bushels would he lose? What per cent of a checked acre with the rows four feet apart, with the hills four feet in the row, and with three stalks to the hill would this loss be?

5. Besides adding to the labor of cultivation, what ill effects do weeds have on your crops?

CHAPTER XII

FIRST STEPS IN CULTIVATION

One of the things giving zest to corn-growing is that the crop must be managed in so many different ways. Even the earliest preparation for the coming

FIG. 120. A STUBBLE FIELD TO BE MADE READY FOR CORN

crop varies somewhat widely in time and manner. After you have set aside certain fields for corn, you cannot begin your preparation of these fields in the same fashion. The preparatory work will depend largely on what crop the corn is to follow.

If you have selected a field which was planted in wheat, oats, or rye, what will be your first step in preparing for your corn? The harvesting of the small grain in the early summer will leave the land

in the condition shown in Fig. 120. Above the surface are the butts of the grain stalks; below the surface is a fairly thick tangle of roots. The decay of these butts and roots will improve the soil and thus be helpful to the corn. In thinking over plans for your first cultivation of such a field two questions arise: Shall you let the field lie untouched

FIG. 121. DISKING A STUBBLE FIELD

until time for the fall plowing, or shall you disk it as soon as the grain is removed? Which will be the better plan?

If you disk the field, what will result? Let us see. First, will not the soil dry out less because the disking will leave an earth mulch on the surface? Will not this dry mulch save moisture that would be lost during the summer months? Will not all saved moisture be helpful to your crop?

Second, will not this disking check a growth of weeds during the summer? Would not a crop of weeds rob the soil of much plant food?

Third, would not the disking loosen the soil and keep it from turning up in clods during the fall plowing?

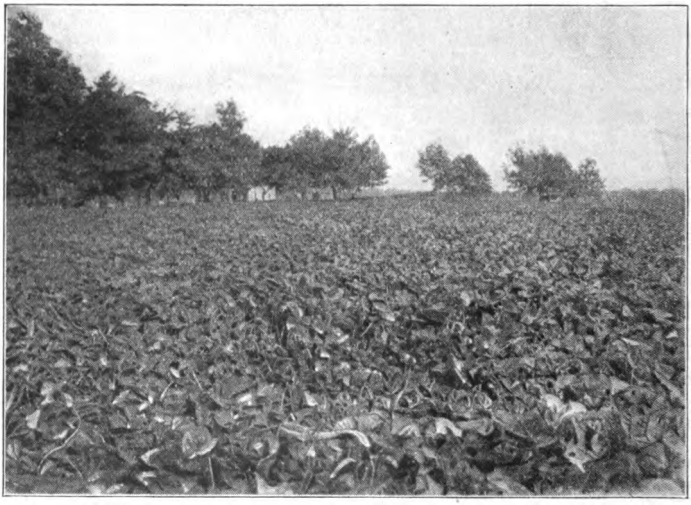


FIG. 122. A LEGUME TO HELP NEXT YEAR'S CROP

Fourth, would not the disking make the grain stubble rot faster? How would this help the soil?

Would you gain anything but a saving of labor by not disking? Do not all the advantages seem, therefore, to be on the side of disking? There is only one case in which you would not find disking the wise plan. In sections of our country where summer crops grow, one of these should follow the

grain and be your first step in preparation for corn. With this exception shall not a prompt disking of small grain stubble be your earliest work in getting such land ready for corn?

What are these summer crops? What will be gained by planting one of them just before corn? You perhaps already know that such crops are called legumes. The name "legume" is one given to a family of plants which have the wonderful power of gathering nitrogen from the air and fixing it in the soil. There are two classes of legumes: one class, containing among others the cowpeas and soy beans, grows in summer; the other class, containing the clovers and vetches, grows in the winter months.

If you are farming in a climate suited to these summer crops, you should never fail to call one of them to your aid in providing food for corn. How does such a crop pave the way for a big corn yield?

First, as just seen, it adds nitrogen to the soil. Nitrogen is the most costly of the plant foods and one of the most needed.

Second, it will produce a dense foliage. If this is plowed under, the decaying foliage will add much humus to the soil.

Third, it will keep down weeds and prevent washing and leaching, and injurious baking during the summer.

Winter legumes, such as the clovers, thrive in some of the same sections in which summer legumes

do. If you live in such a section and are really in earnest about harvesting a big crop of corn, would it not be a capital plan to plant crimson clover just after the summer legume? The cowpeas or soy beans

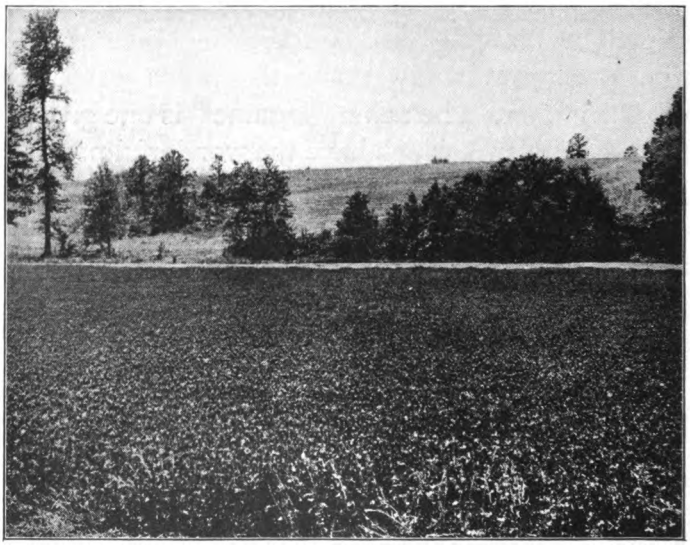


FIG. 123. A WINTER LEGUME FOLLOWING A SUMMER LEGUME

can be turned under or cut for forage in time to sow the clover. The clover, in turn, completes its growth in time to plant the corn. Would not the clover add still more nitrogen and humus to your corn soil? Would this not leave your land in better condition in the spring? Would it not, at the same time, prove an excellent cover crop to save your land from washing and leaching during the winter?

In case you planted either cowpeas or soy beans, both summer growers, and did not follow these by clover, what should be your first steps in getting ready for corn after this crop? There are two plans open to you. The first is to turn under the vines after you have set apart enough to ripen for seed. The vines will, of course, be changed into humus during the winter. By this plan will not your land be enriched by the nitrogen which the roots have gathered? Will it not also be enriched by the humus from both roots and vines? Will the turning under of this mass of vegetation prevent washing? The second plan is to cut the vines for forage after taking care to save seed. By this plan the soil will be benefited only by the nitrogen and humus from the roots and the stubble.

If you follow the second plan, would you have any cover crop on the land during the wintry rains? Would not your land, therefore, be in danger of washing and losing much valuable plant food? Could this washing and leaching be lessened by deep fall plowing? Would not the deep plowing enable the water to sink in and be held in the soil instead of running off? Would not the ridging of the soil by the plowing also open the way for it to be still further mellowed by the winter's freezing and thawing? If the fields from which you took the legume were very sloping, would even deep plowing save them from washing? With sloping

or steep lands would it not be safest to wait until spring to plow? Spring plowing, however, leads to rather rapid loss of moisture. Have you never noted how freshly plowed land "steams" on a warm, spring day? The "steaming" is merely moisture rising out of the soil. Could you not stop this loss of moisture by harrowing just after plowing so as to form a dry mulch on top of the soil? If the harrowing will save this water, why not do it?

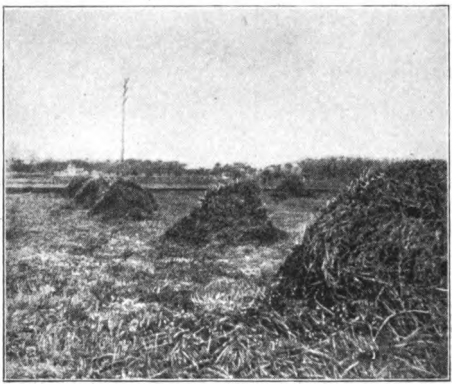


FIG. 124. CLOVER CUT FOR FOOD

In case your way is clear to plant a winter legume like crimson clover just after the summer legume, what will be your first step in preparing for corn after this legume? The clover, planted in the fall, is ready for harvesting at the coming of spring. Like the summer legume, it has benefited the soil by furnishing nitrogen and by lessening washing and leaching, and it is now ready to supply the soil with vegetable matter. Unlike the peas or beans, it offered, if needed, some grazing for the farm animals.

Like the other legume, the clover may be used in two ways. First, it may be turned under and all its vegetable matter changed into humus. This is very helpful to the land, but is attended by one danger. Sometimes in spring the growth of the clover is very luxuriant. If you turn this heavy mass of vines under, it will not rot at once. What may and what often does happen? The plow buries this tangled mass of vegetation. There it lies unrotted for a time between the bottom layer of earth and the top layer. It, of course, separates the two layers. In the top layer you make your seed bed and plant your corn. Then what becomes of the moisture that ought to supply the corn? The moisture below the clover tries to rise, but is stopped by the clover. Through the clover there are no soil tubes to lead the water upward to the corn. Hence the lower water is stopped. The moisture in the seed bed is soon used up, for it cannot be supplied from below. Hence the corn is left thirsty, with an abundance of water almost in reach.

Can you think of a simple way to prevent this unexpected injury to the young corn? If, before plowing, you cut the clover to pieces with a disk harrow, would not this prevent it? Would such disking also hasten the rotting of the vines? Then, too, would it not, if possible, be well to wait two or three weeks after turning under the clover before making your seed bed? This would give more time

for the clover to rot and allow the soil tubes to continue towards the surface. Of course, if the clover was not very thick on the land the disking would not be needed.

The other method of using the clover is to cut it for hay. Will this method add as much humus to the soil? If you turn in only the stubble can you expect to increase your land in fertility?

FIG. 125. DISKING IN THE CLOVER

In case you are so unfortunate as to be forced to plant a field in corn just after it has been in corn, what will be your first step in preparation? You know that crops like corn are called clean-culture crops. The name was given because at the end of the cultivating season nothing but the crop is supposed to be on the ground. There is little vegetable matter to be turned under to aid in feeding the next crop, for the cornstalks do not supply much humus. Will you be able to grow a fine crop without humus? Will you not, as your first step, seek to provide humus? Could you do this in any quicker way than by scattering manure over your

fields? Would the manure add both humus and plant food? If you broadcasted the manure would it not lose plant food if it were left uncovered on the ground? Could you prevent this loss if you disked the manure into the soil as soon as you finished spreading it? Would you spread your

FIG. 126. MANURING WHEN CORN MUST FOLLOW CORN

manure from a wagon by means of a fork, or would you use a manure-spreader? Unless, then, you are farming in a state where summer legumes aid the farmer, the first step to take in following corn by corn is to disk in manure.

In case you live in a section in which legumes are commonly grown, can you not keep your corn from being a "clean-culture crop"? If you planted cowpeas or soy beans or other summer legumes between the corn rows, would you not get from the

legume a supply of vegetable matter to go back into the soil? Would this not save the cost of manuring? Or, if in August or September, you broadcasted crimson clover, rye, or a mixture of the two in the corn, would you not have an excellent way of returning humus to the soil? We have just seen the great help such crops are to the soil. Would not, therefore, the sowing of one of these crops be the sensible first step to take?

In case your corn is to be planted in a field which has been in cotton or tobacco, what would be your first step? Both cotton and tobacco are clean-culture crops. If plowed under, the stalks and leaves of the cotton add considerable humus. The stems of the tobacco would add very little. Cotton and tobacco grow only in parts of the country in which legumes can be raised. Could you not, therefore, follow these two crops by legumes, as was suggested in the case where corn follows corn? Can you think of any better plan to help your corn?

APPLYING THE LESSON

1. If you plowed under a heavy crop of legumes, would you need to buy much, if any, nitrogen?

2. If you had three fields to prepare for corn and each field had just borne a different crop, would you prepare them in the same way?

3. When you plow under a heavy crop of legumes without disking, why do you frequently get so poor a stand of corn? Is this especially true in dry weather?

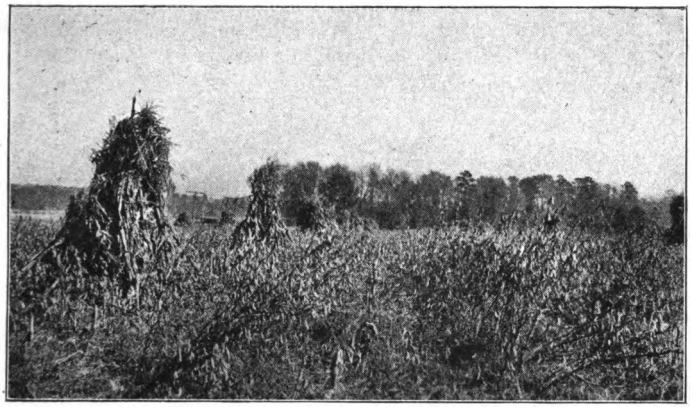


FIG. 127. SOY BEANS BETWEEN THE CORN ROWS

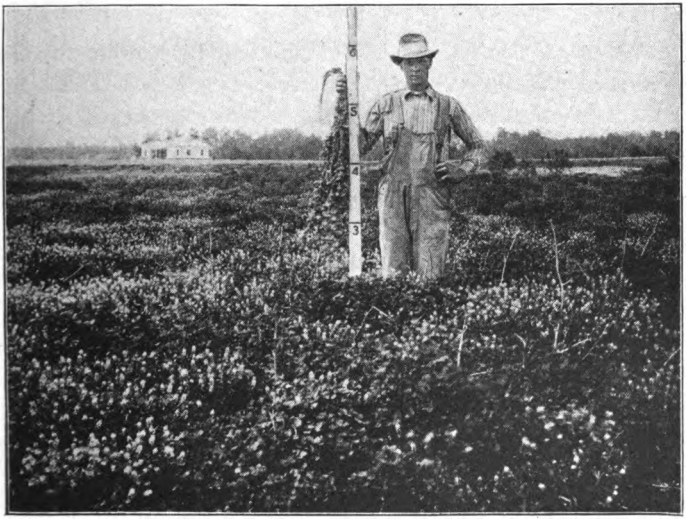


FIG. 128. GETTING READY FOR CORN BY GROWING BUR CLOVER IN COTTON FIELD

4. In passing a plowman you see that he is turning up clods. If there were enough vegetable matter in the soil, would he be troubled with these clods?

POINTS FOR THOUGHT

1. Explain why bottom lands are frequently more fertile than the neighboring uplands.

2. Here is a piece of land which packs after a rain. In the light of this lesson, how could you change this land into good corn land?

3. Would you prefer rye or clover as a cover crop? Is the rye a legume? Would it add any nitrogen? Would both crops provide some spring grazing? Which can be removed from the land the earlier?

4. When the owner of a piece of land found it had little humus left in it he planted it in clover. In the spring he was undecided whether to cut the clover or turn it under. Which would you advise?

5. A farmer is much troubled by his land's washing. Can you mention three ways to lessen the washing?

CHAPTER XIII

THE SECOND STEP IN CULTIVATION

The plow, as we all know, is one of the oldest tools of the farm. In its first form it was only a forked stick. It was drawn in earliest days by man, but when he tired of this irksome task, animals were harnessed to the plow. From an early form like the clumsy tool illustrated in Fig. 129, the plow has been changed to costly implements like that pictured in Fig. 130. It is interesting to know that two of America's ablest statesmen—Thomas Jefferson and Daniel Webster—were inventors of plows. During all these changes the plow has continued to be the main tool of cultivation. So clearly has this been understood that farmers are called followers of the plow.

We would think that, during the centuries in which the plow has been the farmer's mainstay in cultivating plants, all questions as to plowing would have been decided. We would think that by now every "follower of the plow" would know why he plows, how to plow, and when to plow. But these questions, the most important in farming, are still debated.

If you were asked why you plow, what would be your answer? A thoughtful farmer on being asked

this question gave the following reasons. Do you agree with him? "I plow," said he, "to get these results:

"First, to cover with earth all grass, stalks, leaves, and other vegetable matter on the land. If these are covered they will soon rot and become a much-needed part of the soil.

"Second, to loosen the soil so that rain, instead of running off from hard soil and being lost, may easily soak into the plowed land. There it will be held, like water in a well, until my plants are ready for it. Any loss of moisture is almost a sin.

"Third, to keep the grains of soil fine and close to one another. If the grains are not too loose, the spaces between them will act like tubes to lead up moisture from below the surface as plants are ready for it.

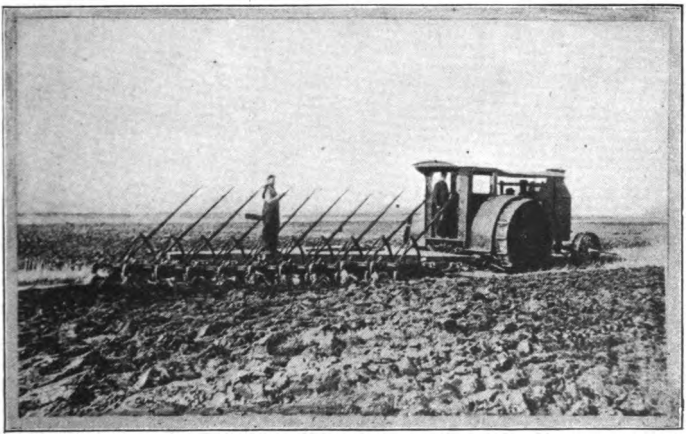
"Fourth, to soften the earth so that plant roots may push easily into the earth in search of plant food and have a wide feeding-area.

"Fifth, to open the soil so as to let in air and water. This weathering will add to the supply of plant food and allow the land to be benefited by freezing and thawing.

"Sixth, to kill the weeds so that their seed may not produce a crop to cumber the ground in the spring."

Since plowing, then, is important in so many ways to the tiller of land, should not everyone who

FIG. 129. ONE OF THE EARLIEST FORMS OF A PLOW



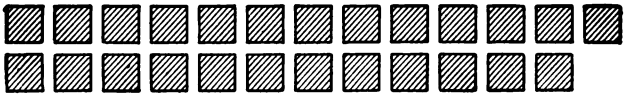


FIG. 130. A TRACTOR PLOW

The squares show the number of acres broken in one day by this plow

expects to farm learn the best methods of plowing? In England and Scotland farmers have regular training schools to teach boys how to handle plows. Prizes are offered yearly to young plowmen who in plowing contests display the most skill and judgment.

FIG. 131. A WELL-PLOWED FIELD

In some of the Western states of America plowing contests are made the main events of a yearly holiday. Why should you not persuade your school to start such a contest?

What is to be sought in plowing a field? No plowing is satisfactory unless:

First, the furrows are straight and of uniform depth and width.

Second, the plow sets the furrow slice on edge so that the soil may easily weather. If the slice is turned entirely over, weathering is not so easy.

Third, the plow leaves no land unbroken between the furrows.

Fourth, the plowing thoroughly covers all weeds, grass, or stubble.

Keeping in mind these facts as to methods of plowing, you must next decide when you will break the land for corn. Shall you do this breaking in the fall and early winter or shall you wait until spring? Of course, if the land to be seeded in corn was sown in a winter legume, you would be forced to put off the breaking until spring. However, as the spreading roots of this winter crop would keep the land open, would the legume not really be doing your fall plowing?

In all other cases, unless the weather is too severe or too wet for farm work, the question of early or late plowing must be decided. It sometimes happens that affairs on the farm, like a scarcity of labor or the gathering of other crops, make it impossible to do any fall or early winter plowing; but if a farmer can control his time and his plows, are there any advantages in early plowing? The applying of some truths which you already know may assist you in answering this question.

If in the fall your land has a cover of vegetable matter on it, are you willing for any of this matter to be wasted? Do you not wish that every ounce of it may be changed into humus to aid in nourishing the corn in the spring? Would not the rotting of this vegetable matter be hastened by covering it in the fall? How do plants feed? You recall, do you not, that all plant food must be dissolved in water and then drawn into the plant's life by the hairy

roots? Now, if the vegetable matter on the soil in the fall remains unrotted until spring, will not the water and the root hairs have a hard task? Would their work not be made easy if the fall covering had changed all the matter into humus? Hence, for the turning of all vegetation on the land into humus, is not fall and early winter plowing a wise practice?

FIG. 132. IS THIS A SATISFACTORY WAY TO PLOW?

Again, you know how necessary it is to plant growth to have the soil fined and mellowed. If you plowed before very cold weather, would this not leave your soil in a proper condition to be crumbled by the freezing and thawing of winter? Would not this winter weathering be useful even in comparatively warm climates? Therefore, for the sake of using nature's power instead of horse power, is not fall plowing advisable?

The great army of insects that attack corn must be fought. Will not plowing your land early in the fall help to break up their winter homes? Will it not turn many of them out of comfortable quarters to be destroyed by cold? So, if you want to lessen

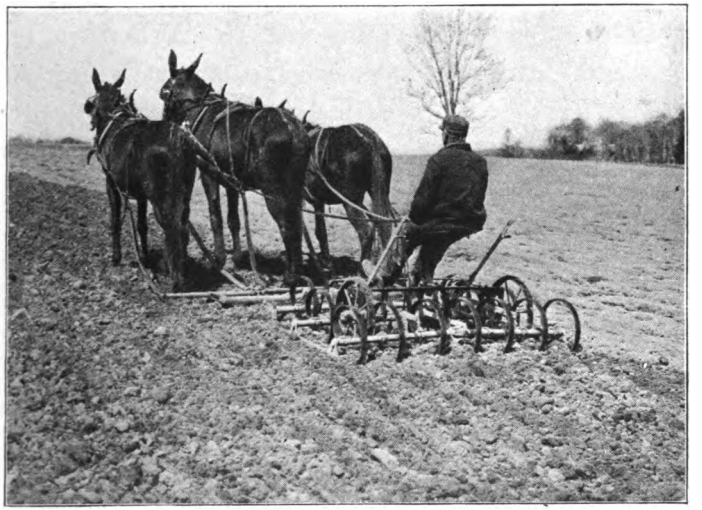


FIG. 133. SAVING MOISTURE BY A SPRING-TOOTH HARROW

the injury done by insects, can you do it in any easier way than by wrecking their winter homes by the plow?

Saving moisture is one of the surest ways of adding bushels to your corn crop. Does fall plowing save moisture? Have you not noticed that the top soil of ground which was plowed in the fall or winter is drier at planting time than the top soil

of land not so plowed? Did not the fall plowing so open and loosen the soil that rain could sink down deep? Since the rain went deep into the soil does this not leave the surface dry? Will not this dry soil warm up early in the spring? What aid will this warm soil be to the sprouting of your corn? What to its vigorous young growth? When the hot days come, will the moisture far below the surface be drawn to the top? Will not this be the very time at which the moisture is needed? Therefore, is not the saving of moisture another reason for fall plowing?

To still further save moisture you must call your harrow into service, as is shown in Fig. 134. Fine clay soils, especially in sections of heavy rainfall, should not be harrowed in the fall after the plowing. A harrowing would make them run together and pack. However, fall-plowed lands should always be harrowed early in the spring. Lands which are not broken until the spring should at once be harrowed. The dry surface mulch left by the harrow is nature's way of saving water.

There is always more or less of a rush in the spring to get the seed bed ready and the seed planted. Cannot a farmer spare time for breaking his land in the fall or winter better than he can in the spring? Is this not an excellent reason for his getting part of his plowing done ahead of the rush? Therefore, lastly, for the sake of saving time is not fall plowing the best rule?

With a big corn crop in mind, how deep should you break your land in the fall? This is a hard question to answer. The depth of plowing should be governed by the kind of soil and its condition

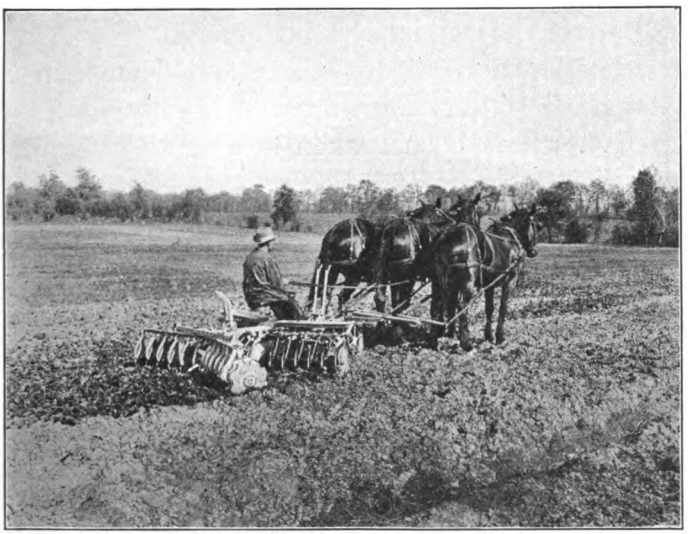


FIG. 134. A CUTAWAY HARROW

and by the climate. There are, in America, many different kinds of soils in which corn is planted. There is a wide range of climates and soil conditions. A depth that fits the needs in one place or in one soil may not be what is needed in other circumstances. Learn from your State Experiment Station and from the most successful corn growers in your neighborhood what is the best depth for your farm.

The following general suggestions may always be kept in mind:

First, open, loose, porous soils, such as sandy lands and lands full of humus, do not need as deep plowing as heavier lands. In such soils a depth of six or seven inches is probably enough.

Second, the ordinary clays and loams in an average condition of fertility will usually yield best when they have been broken to a depth of eight to ten inches.

Third, thin clay and thin loamy soils, which have never been broken deeply, should be gradually broken to a depth of eight to ten inches.

Fourth, on all but very loose soils, the deeper the plowing within reasonable limits the wider is the way opened for the pasturage of your corn roots and the holding of moisture.

Spring plowing should never be as deep as fall plowing. Remembering how moisture rises in soils, can you give a reason for this rule? In spring plowing there are four things that should always be done and two that should never be done. These are as follows:

First, the plowing should be done early before the hot sun and the wind rob the land of its moisture. As soon as the ground will crumble readily, start your plows.

Second, the plowing should be done in ample time to warm the earth for the corn seed. The

warm seed bed will favor germination of the kernels and hasten the growth of the young corn.

Third, the plowing should be finished a week or two before seeding time so as to allow the loose

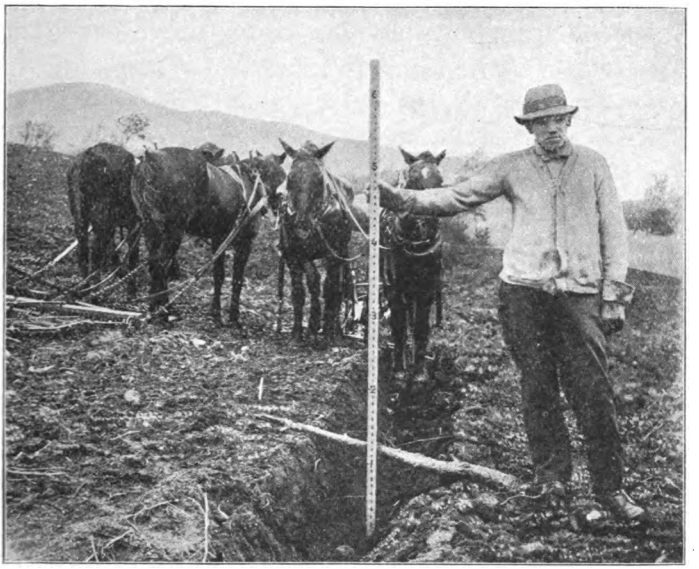


FIG. 135. A HARROW FOLLOWING DEEP PLOWING

earth to settle. As soon as the earth settles, the soil tubes will form and bring up water as it is needed.

Fourth, the plowing should always be done in accordance with the kind of land. Loose soils may be plowed earlier than heavy ones.

The two things that should never be done are these:

First, the ground should never be plowed when it is too wet. Often the farmer is so anxious to start his crop that he plows before the ground is dry. The clodding of the land from being plowed when it is too wet will often injure it for a year or two.

Second, the plowing should, on the other hand, not be done when the ground is too dry.

APPLYING THE LESSON

1. A plowman undertook in the spring to prepare a city lot for corn. Here is what a farmer noticed: first, the plowman burned the weeds on the lot; second, when he had finished plowing, the furrow slices were slick and uncrumbled; third, he left the soil untouched some time after he plowed it.

Name each mistake the plowman made.

2. A young farmer making his first crop of corn on a rather heavy clay loam soil which had just been in cotton took these steps: first, he burned the cotton stalks in February; second, he broke his land nine inches deep on March 15; third, he disked his land on April 15; fourth, he planted his corn on April 16.

Point out all his mistakes.

POINTS FOR THOUGHT

1. How is deeply plowed land like a well?

2. Why is the power of water to dissolve so many substances exceedingly helpful to the farmer?

3. Try to work out why the moldboard of all plows has the same general shape.

4. Why will corn growing on clay or other close-grained soils which have not been plowed deeply suffer from drought in a dry season and from too much water in a wet season?

CHAPTER XIV

THE THIRD STEP IN CULTIVATION — THE SEED BED

Suppose that just as a healthy, hungry boy seated himself at a table which was loaded with palatable food, someone were to tie his hands and then say, "Help yourself freely to every dish on the table." The boy, if left tied, would starve in a house of plenty. You would think this a cruel way to treat the boy.

Yet do we not often treat plants in this very way? There is plant food in most lands if we till them deeply and pulverize the soil; but instead of putting this food within reach we prepare a cold, rough, shallow seed bed. In such a bed we plant our corn and practically say, "Now sprout and help yourself to all the plant food in sight." Are not the roots of the plants tied by the shallow feeding-bed just as the boy's hands were by the cord? They cannot reach out and get the sorely needed food stored in the hard earth. They can feed and grow apace only when they are provided with a deep, warm, moist, mellow seed bed.

Is not the plowman shown in Fig. 136 preparing a seed bed that will tie the roots of his corn and

starve the plants? Can one lean mule furnish power enough to break a seed bed for corn? Is the plow set to go deep in the ground? Could you reasonably expect plants to grow among the clods he is turning up? Moisture is always needed. Could you depend

FIG. 136. PLOWING THAT WILL TIE THE ROOTS

on his shallow furrows to hold moisture? Would such plowing let air into the soil to any depth? Is not the plowman stirring only soil that was stirred the year before? Will this add any fresh pasturage for the roots? Look at the tiny corn roots illustrated in Fig. 137. They are so tender that a touch of your finger will break them. Yet they must push their way down into the soil or the plant will starve.

Can these soft, threadlike roots force themselves into hard earth? The roots of thrifty plants must grope about and find food in a wide feeding-ground. But how can they do this unless mellow soil opens for them? The deeper they can go into the soil the more moisture they can reach and send up to the plant. Can they find moisture if they are stopped by hardpan three or four inches below the surface? What will happen to the plants in the hot summer days if these roots fail in their search for lower moisture when the top moisture has been all used? Then take a look at these tender roots after they have grown much older. You see them in Fig. 138 as they are feeding the almost ripened stalk. How widely and how deeply they are searching for food to build up the ear! If hard, dry, barren ground stops this search, what must become of the ear? Surely the seed bed the man is making with his one-horse plow will not make a favorable feeding-ground for corn roots.

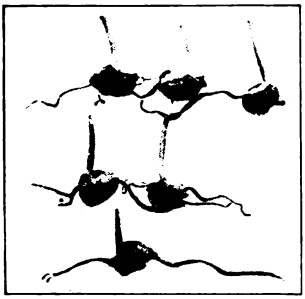


FIG. 137. TINY CORN ROOTS

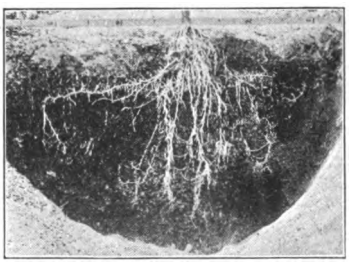


FIG. 138. ROOTS FEEDING A STALK

Now turn from this unpromising start in making a seed bed to the proper start shown in Fig. 139. Here you will find a field that was deeply plowed in the fall. Then, in Fig. 140, the spring disking is being done as soon as the land is fit. The disk harrow is going about three inches deep. The third

FIG. 139. FALL PLOWING

picture (Fig. 141) shows the smoothing harrow at once following the disk. Then, at least two weeks after the harrowing, the rows should be laid off.

What sort of seed bed do you now have for the tender, wide-feeding roots? Did not the deep fall plowing enable the field to hold the winter rains and thus insure moisture for the corn? Did not the plowing also permit air to make its way into the soil? Did it not put the soil in condition to get the benefit

of all winter frosting and freezing? Will not the seed bed be deep and soft for the roots to find easy traveling in their search for food?

What do you gain by the spring disking? Does it not further pulverize the earth? Does it not cut up and hasten the changing into humus of any vegetable matter which may have been left on the land? Does it not check and destroy the hardy weeds of early spring? Will it not smooth and level the soil? Will not the settling of the land after the disking help the soil tubes in getting ready for their very necessary work of bringing up moisture?

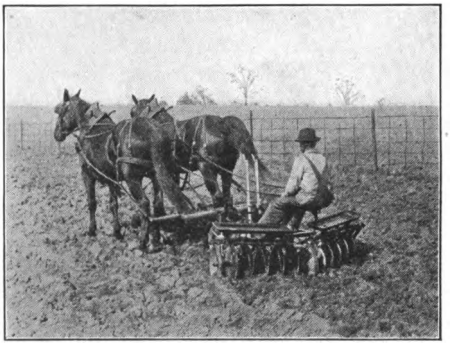


FIG. 140. SPRING DISKING

In what way will the harrowing on the heels of the disk be a benefit? In the spring moisture rises rapidly from prepared land. Can you spare the moisture? Will not the harrowing stop any moisture loss by the top mulch of dry soil which it forms? Will it not also add to the complete fining of the soil? Will it not also assist in pressing the soil grains together so as to make easier the task of the soil tubes? Could you find many clods after these

three cultivations? Would not such a seed bed soon be warmed by the sun and thus speed the perfect sprouting of your grain? In case a heavy rain should fall after you had either disked or harrowed, would it not pay to run the harrow over the land again? As an ambitious corn grower—one who wishes to make

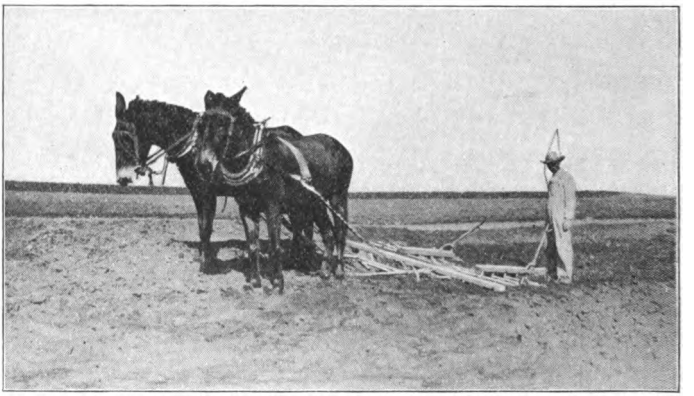


FIG. 141. SMOOTHING HARROW FOLLOWING A DISK

a crop of corn in which he may find a just reward for his labor—are you not willing to prepare such a seed bed?

POINTS FOR THOUGHT

1. What harm results from clods in the seed bed?

2. What does a corn grower gain by harrowing his land after each rain?

3. In case you disk your land with a horse disk and not a tractor, should the harrow which follows the disk run in the same direction that the disk ran or in an opposite direction?

4. Why should the smoothing harrow follow and not go ahead of the disk harrow?

5. A thoughtful farmer always wants a warm seed bed. Would drainage increase the warmth? Would cultivating add to the warmth? Would the addition of vegetable matter increase the warmth?

6. Do you understand what is meant by "lapping" with the disk harrow? Why does a farmer often "lap" when it is slower than not "lapping"?

CHAPTER XV

THE FOURTH STEP IN CULTIVATION — PLANTING

Spring brings the task of transferring your selected seed from its protected storehouse to the warm, moist, mellow seed bed. Then you can only wait for what has been called the "yearly miracle of spring" — the changing of the cold, hard seeds into living plants. Every really thoughtful corn-grower is eager to know how he and nature may work hand in hand to produce a bounteous crop.

If you wish to work with nature you must be ready to plant as soon as nature warms the soil. You no doubt recall that it takes air, light, moisture, and warmth to germinate seed. Of course, the soil has air, light, and moisture all during the winter, but sufficient warmth to sprout corn comes only with the spring. You should, therefore, have everything in readiness to plant your seed corn as soon as the necessary heat is added to air, light, and moisture. The Indians, who always watched nature, followed this rule: "Plant corn when the leaves of the white-oak tree are as big as a squirrel's ear." As the leaves of the white oak come earlier in Southern than in Northern sections, was not this just their way of saying, "Plant when the earth gets warm"? The more

often the grower gets his corn planted as soon as his seed bed is warmed, the more often he harvests a heavy yield.

Heat enough for planting comes early in Southern climates. Thence, as the warmth of spring moves northward, the time of planting goes with it. The

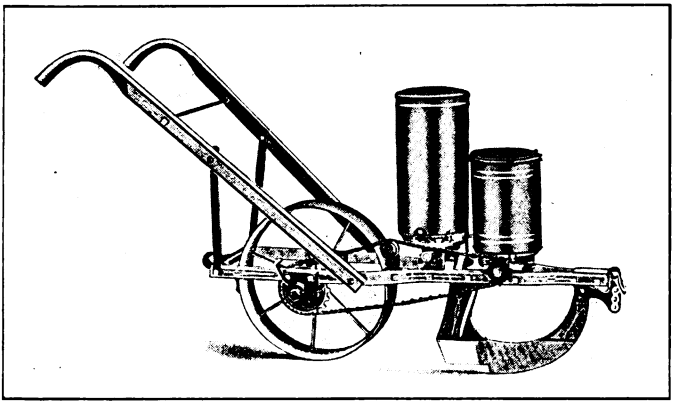


FIG. 142. SINGLE-ROW PLANTER

time for seeding, therefore, cannot be fixed by the almanac, but must depend on the arrival of sufficient heat. There is no use planting corn in cold, damp ground. You get a new idea of how widely corn is grown in America by remembering the length of time which is needed for this spring warmth to move across the corn-growing sections. The seed beds of Texas, the southern limit of our country, are warmed three months before those of Minnesota, which state is on the line of our

northern boundary. Beginning in Texas, farmers start, section by section, thousands upon thousands of corn planters to dropping their seed, and yet three months must pass before all sections have finished the immense task. While this is true, however, it will interest you to know about what time the soil is usually warm enough to plant in the various states. The following table, prepared by Bishop, shows the average dates of planting and of harvesting and the length of the growing-season.

RATE OF NORTHWARD CORN-PLANTING MOVEMENT

State	Planting-Date		Harvesting-Date		Growing-Period	
	Beginning	Ending	Beginning	Ending	Days from Beginning of Planting to Beginning of Harvesting	Days from Ending of Planting to Average of Harvesting
Florida . . .	Feb. 21	Apr. 2	Aug. 23	Oct. 17	183	198
Texas . . .	Feb. 27	Apr. 4	Sept. 6	Nov. 18	191	228
Louisiana . .	Feb. 27	Apr. 24	Sept. 1	Nov. 4	186	194
Arkansas . .	Mar. 18	May 6	Sept. 23	Nov. 4	189	182
Oklahoma. .	Mar. 24	Apr. 30	Sept. 14	Dec. 9	174	223
Kansas . . .	Apr. 14	May 18	Oct. 11	Dec. 16	180	212
Missouri . .	Apr. 14	May 22	Sept. 23	Dec. 16	162	208
Illinois . . .	Apr. 30	June 2	Sept. 26	Dec. 10	149	191
Nebraska . .	May 3	May 29	Sept. 23	Dec. 19	153	204
Iowa. . . .	May 4	May 26	Oct. 19	Dec. 6	163	194
S. Dakota . .	May 9	June 1	Oct. 12	Nov. 29	157	171
Wisconsin .	May 11	May 28	Sept. 9	Sept. 28	121	123
Minnesota .	May 13	May 30	Sept. 9	Sept. 28	119	121
N. Dakota. .	May 14	May 31	Sept. 8	Sept. 23	117	120
Michigan . .	May 15	June 2	Sept. 10	Sept. 29	118	119
Maine . . .	May 17	June 6	Sept. 12	Sept. 30	118	116

The map given in Fig. 143 groups the states and their dates of planting in the largest corn-growing sections.

As you see from the table the warm states have a much longer period in which to plant corn than do the colder states. In Alabama corn may be seeded for about two months, while in Wisconsin or North Dakota if you delay planting for seventeen days after the ground is warm enough to plant, your corn will most probably be killed by frost. In the Cotton Belt there are on an average about fifty-three days, after the date of beginning, in which you may plant without fear of losing your harvest. In the winter-wheat states, like Kansas and Nebraska, the time in which you may plant is limited to about thirty-three days. In the spring-wheat states, like the Dakotas and Minnesota, the time is decreased to nineteen days. This length of planting-time gives, in the Southern states, an opportunity to plant corn after the winter legumes

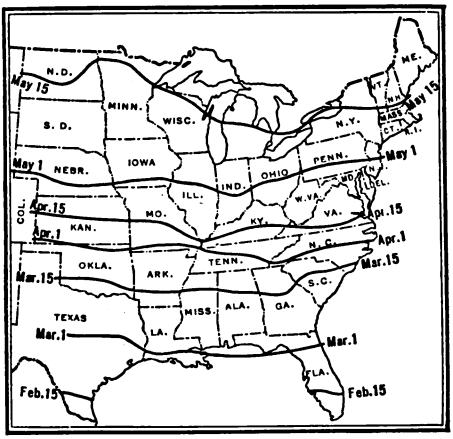


FIG. 143. DATES FOR SEEDING

and other crops, like rye and Irish potatoes, and consequently a farmer may plan a wider rotation of crops than he can in colder states.

With the time of planting fixed by nature there comes the thought of the best method of planting.

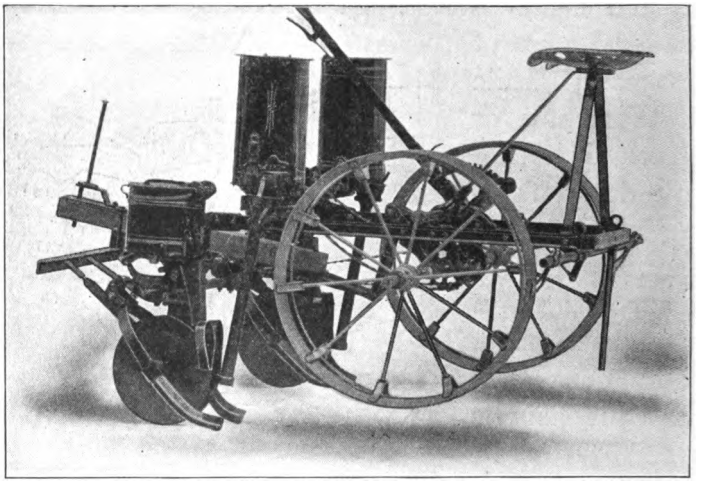


FIG. 144. DOUBLE-ROW PLANTER

Will nature's laws guide you in deciding how to plant? If you are to plant in a section where there is too much moisture and no way to drain it off, should not your manner of planting be determined by this fact? On the other hand, if you are to use for your corn a well-drained soil lying in a region of average rainfall, should you not plan to plant in accord with these conditions? Lastly, if you are to seed your corn either in coarse sandy or

gravelly soil in which water sinks rapidly, or in a region of small rainfall, would you not keep these conditions in mind?

Let us think how we may work with nature in the three cases which we have just been considering.

FIG. 145. RAISED SEED BEDS FOR WET LANDS

First, take thought to the wet lands. In the South, especially, there are large bodies of low-lying wet lands. These lands are so level as to forbid natural drainage. How can you raise corn in such lands? Evidently, since you cannot drain off the water, you will have to raise your seed beds and let the extra water sink below the corn roots. Water in a corn row, as well as everywhere else, will seek the lowest level within its reach. If you raise rounded seed beds and plant your corn on the top of these

ridged beds, will you not leave a low furrow between each of these long beds? Will not the extra soil moisture in the bed drain down into these furrows and leave the roots a fairly dry seed bed? In case of heavy rains will not these water furrows, as they are called, carry off the rain before it can drown the young plants? Will not the rounded, raised bed furnish a larger surface to take in the sun's heat than a flat surface would?

Hence, when nature supplies too much water, ridge the land, and thus get nature to help in draining it, and you can raise a good crop.

Are there any reasons why this ridged method should not be used for other than wet lands? There are several. In drained lands, which get just about sufficient moisture to raise a crop, would not this method waste water? If, in this case, water drained away from the roots into the water furrow, would not the plants be badly injured in dry weather? Can you run a harrow or cultivator over such bedded rows as conveniently as you can on smooth lands? If you cannot, will you not be forced to use the hoe to remove weeds in the row? Would this not take more labor and add to the expense?

Second, in case you have well-drained, finely grained land and a sufficient yearly rainfall, what method of planting is best suited to your soil? With this sort of soil and with this amount of moisture will you have to make raised beds in order

to drain water away from your plant roots? Will you, on the other hand, have to plant deep under the surface in order that the plant roots may find moisture? Since you are so fortunate as to farm on land with neither too much nor too little moisture, will not your natural plan be to seed the land just as it was left by the last harrowing? This method of planting is called surface planting, or flat planting. Would not ridging such a soil lead to drawing moisture from the roots? Would not planting such land very deeply perhaps lead to poor sprouting and certainly be needless trouble?

In surface planting two methods are common: one of these is the check-row method, the other the drill-row method.

In the check-row system the land is laid off in straight rows crossing the field in opposite directions. Such a field is shown in Fig. 146. The kernels are planted only at the points where the rows cross. Usually from two to three seed kernels are dropped at each of the crossing points, or hills. What are the special merits of this widely used method of planting? With this method of checks could you not run your tillage tools in the same direction in which your planter dropped the seed, and then run them across the field in an opposite direction? Would this not enable you to cultivate on all sides of your plants without hoeing? Would this not lessen the cost of production?

Could this method be used on all kinds of land? Could you use it without too great cost on small, irregular fields? Could you use it on terraced lands? Could you lay off hilly or sloping lands in checks? If you did, would there not be danger of washing?

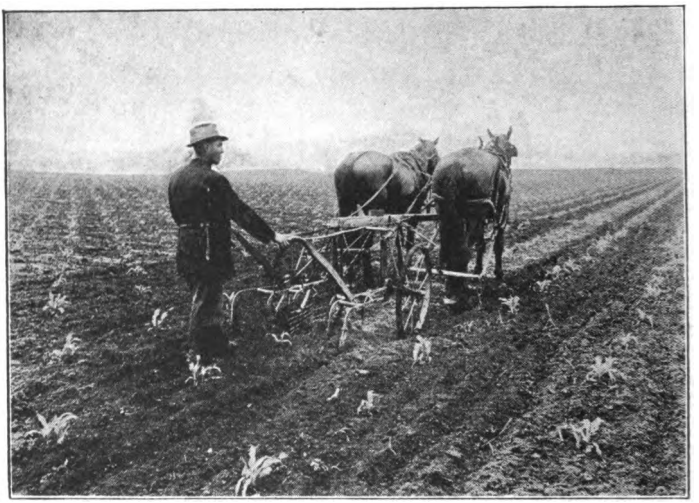


FIG. 146. A CHECK-ROWED FIELD

Is it not probable that one plant standing alone in a furrow twelve inches from another plant can find food and moisture more easily than three plants standing in one hill three feet from other hills?

In the drill-row method the seed is planted in straight rows without checking. The planter usually drops one kernel to a hill, and the hills are much closer to one another than in the check-row method.

What are the advantages of this system? Can you not use this method on either flat or hilly land? Can you not run your rows around the hills and thus save washing? Can you not, in like manner, run your rows with your terraces on broken land? Does not this drill-row plan provide more space for each stalk and prevent root crowding? Will not a plant standing entirely alone find a greater pasturage of moisture and plant food than three plants standing in a hill? On the other hand, will it not be harder to keep down weeds and grass with tillage tools by this method, since you can run them only one way? Hence, for flat lands will the check-row plan not be cheaper than the drill-row method?

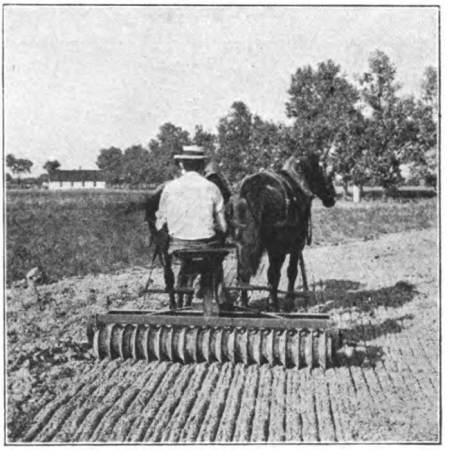


FIG. 147. FLAT PREPARATION FOR PLANTING

Third, where land is so gravelly or so sandy that water sinks rapidly into the soil, or in dry regions, what is the best method of planting? In these cases do you not need to work with nature and plant your corn where it can most easily reach moisture?

Will you not have to plant deeper than you do in surface planting? The method by which this is done is known as listing. In those parts of the South and Southwest in which very light soils are found, and in all the limited-rainfall area west of the main Corn Belt, this method is in very general use. Where the

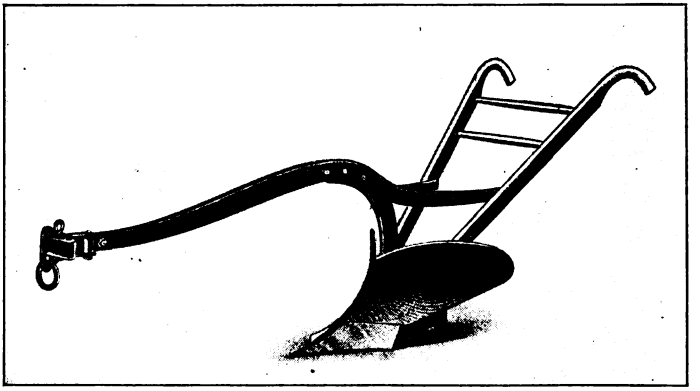


FIG. 148. SIMPLE LISTER, OR "MIDDLE BUSTER"

land is loose and friable and where there is not much vegetable matter in the soil, listing is the cheapest method of planting, for such land can be listed and planted without any other preparation. If, however, the land is at all stiff or if there are many weeds and much grass on the surface, the land should be disked or harrowed some days before it is listed.

Listing is mainly done in three ways: First, by a simple lister, or "middle buster," as it is often called. The simple lister is shown in Fig. 148. As you see,

it is merely a plow with a double moldboard. One moldboard throws the earth to the right in a low ridge; the other throws the soil to the left in the same manner. A planter follows in the furrow made by the lister and drops and covers the kernels. The depth secured in this way enables the kernels to obtain the needed moisture. When corn is listed only about one third of the land is touched by the two tools.

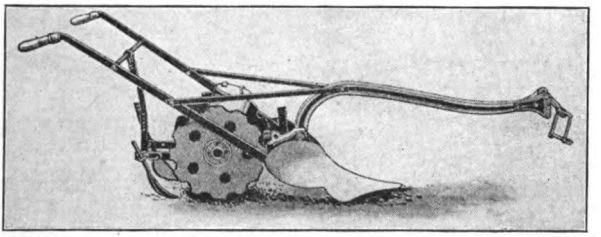


FIG. 149. LISTER WITH ADDITIONS

Second, by a lister with several additions to it. These additions are clearly pictured in Fig. 149. The first is a subsoil stirrer, which is fastened just behind the lister and runs in the same furrow. This loosens the bottom of the furrow and makes it the seed bed. The seed dropper is attached behind the subsoiler, and back of the dropper are the coverers. With this instrument one man with three heavy horses can plant seven acres a day.

Third, by a combined planter and lister, as shown in Fig. 150. This is often called the furrow-opener method. The furrow opener is in front; then follow

the teeth to loosen the soil and then the dropper and coverer. This method should be used only on well-prepared land.

What are the merits of listing? As this method, except in the last case, saves one or more workings

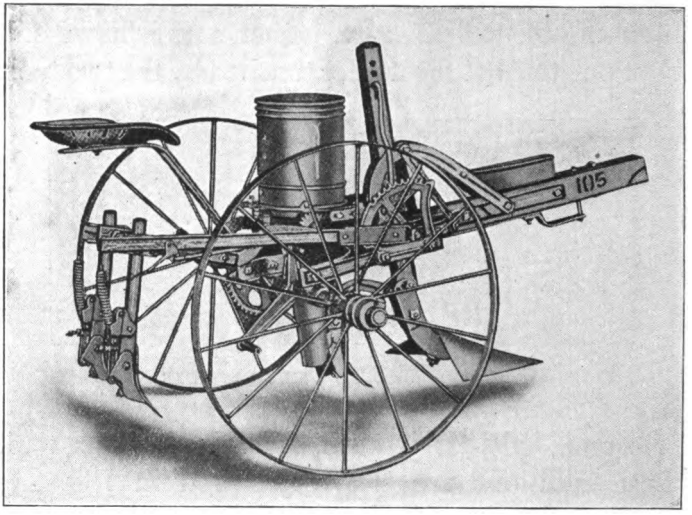


FIG. 150. COMBINED LISTER AND PLANTER

of the soil, will it not be the cheapest plan? As the kernels are planted so deep that the corn roots can reach what moisture there is in the soil, should not corn so planted stand dry weather well? Would not the plants mature on less water than they would in the other ways? Would not the corn planted so deep in the soil grow slowly in the spring? Would not the slow growth cause a less vigorous growth of

blades and stalks? As the blades and stalks consume much moisture, would not this slow growth save moisture? As the lister throws earth away from the roots, would it not throw the weed seeds in the earth away from the hills? Could the weeds, after they have sprouted in the middle of the rows, be killed there more easily than around the new plants?

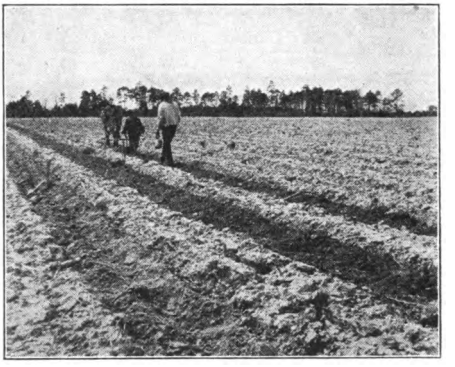


FIG. 151. PLANTING BY HAND

There are, however, several objections to the listing methods. Would this deep planting in cold soil make germination more difficult? In case of very hard rains, would there not be danger of drowning the low-set plants and of washing the seed furrow very badly?

In all of the methods of planting corn the actual dropping of the seed kernels may be done in several ways. If only a small field, say eight or ten acres, is to be planted, hand dropping, as shown in Fig. 151, or a hand machine similar to the one in Fig. 152, is the cheapest plan. For large areas a one-row or a double-row planter is, of course, much cheaper than hand dropping. As already seen, the listers have

droppers attached. For planting in checks the check-row planter, shown in Fig. 153, is widely used. Before using any of these implements the kernels should be graded for uniform size and the planter carefully set. To secure kernels of about the same size would you not exclude the irregular kernels on the tips and butts of the ears? To keep from injuring the kernels by passing them through a sheller should you not shell your seed ears by hand, or use such a device as is illustrated in Fig. 154? Is not thinning out the extra stalks a costly custom? Will it not, therefore, save time and money to drop only as many kernels as you want stalks? Can you not count on the germination of good seed?

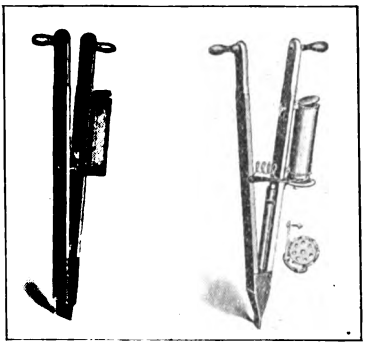


FIG. 152. A HAND PLANTER

Before you set your planter you will of course have to determine three things: first, how wide apart to lay off your rows; second, how far from one another to make your hills in the rows; third, how many kernels to plant in each hill.

The experience of thoughtful growers is that, as a rule, the rows should be from three and a half to four feet apart. The distance, as we shall presently learn, should be less for rich lands than for poor lands.

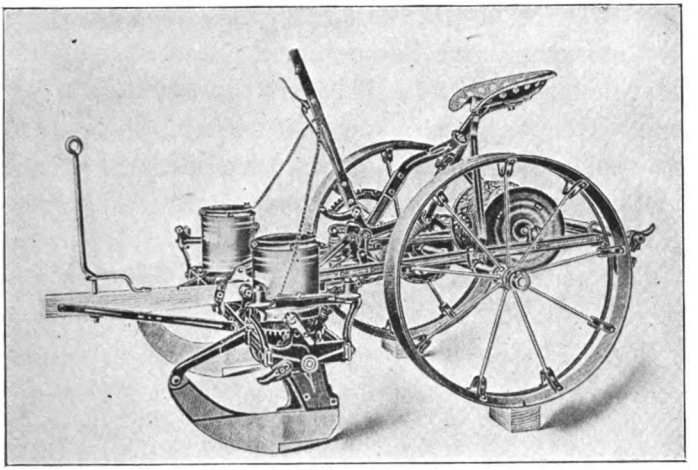


FIG. 153. CHECK-ROW PLANTER

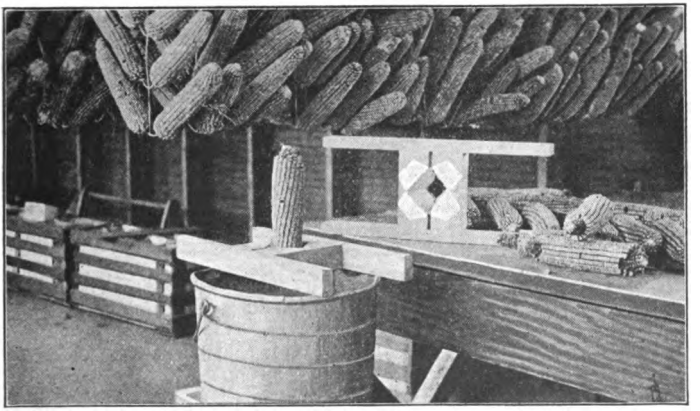


FIG. 154. A DEVICE TO REMOVE KERNELS FROM BUTTS AND TIPS

The distance of the stalks, or hills of stalks, from one another cannot be so readily fixed. Of course, well-tilled plants will thrive in proportion to the amount of plant food and moisture in the soil. If there is not much plant food or moisture for your plants, can you expect to grow a large number of heavily eared stalks? Would not the food and moisture have to be divided among all the stalks? If you lessened the number of stalks, would not each stalk get more nourishment? Would not this smaller number of well-nourished stalks yield more well-filled ears than a larger number of badly nourished stalks? If you increased the number of stalks on poor land, would you not expect that the further division of food and moisture would force the stalks to bear a very abundant crop of nubbins?

If, on the other hand, the soil has a sufficiency of food and moisture to support a large number of stalks, should you not be sure to plant them? Again, some varieties of corn have larger stalks than others. The large stalks require more food and moisture for proper fruitage than do the smaller stalks. Could you not, therefore, plant more stalks of a small variety on an acre than you could of a large variety? Do you not then see that the thickness of your planting must be governed by the fertility of the land, by the amount of moisture, and by the variety seeded?

In the check-row method, kernels are dropped only where the rows cross. At what distance shall

these check rows cross? Must not the rows be wide enough apart for a horse and a cultivator to pass each way? Could the rows, then, no matter how rich the land, be less than three feet apart? If the land be very poor, would even five feet be too wide? The

FIG. 155. RICH LAND MAY BE THICKLY PLANTED

general opinion of the users of this method is that a distance of from three and a half to four feet is most satisfactory.

How many kernels should be dropped in each hill? Do not forget the guiding rule, "The richer the land the thicker the seeding; the poorer the land the thinner the seeding." In the great Corn Belt three kernels to the hill seems best for fertile

land. If the land is unusually rich, four may be planted. In the South, since the corn grows considerably larger than in the main Corn Belt, only two kernels should be seeded to each check. In the North, where flint corns are grown, the small stalks and ears of that type enable you to plant four or five kernels to the hill.

In the raised-bed method, in the drill-row method, or in the listing method of planting, a distance between the rows of three feet for rich land and of three and a half to four feet for average land is the usual rule. In these methods, of course, the kernels are not dropped in checked hills. They are dropped singly in the row, or they are planted by twos, by threes, or by fours. In regions of sufficient moisture the highest yields on equally fertile lands seem to be obtained when the stalks stand singly and at a distance from one another of from twelve to fourteen inches. In the dry regions the plants should stand singly, but the distance apart should be increased. The stalks should stand at least eighteen inches apart in comparatively dry land and about thirty-six inches in very dry and poor land.

The problem of spacing having been settled, you have next to consider the depth of planting. Are not light and air generally present in the soil? Will not warmth and the proper amount of moisture, therefore, be the two things to think of in planting? What will happen to the seed if there is too much

moisture? What if there is too little? What if there is no warmth? In the early spring is the earth warm to any great depth? Would it not be foolish to plant deeper than the earth is warmed? Hence, would you not avoid deep planting at that time? As spring advances can you plant deeper? Since corn

FIG. 156. WIDE ROWS SUIT POOR LAND

roots are near the surface, will you ever need to plant very deep? If the earth is warm and dry would you plant deeper than if the earth were warm and moist?

In planting will you not also have to think how different soils hold water? You know how moisture sinks in sandy soils. To secure moisture for your seeds in such land would you plant deep or shallow? On stiff clay land what would be the danger in deep planting? As a rule, farmers plant their corn too deep. From one to two inches is generally deep enough.

APPLYING THE LESSON

1. A corn-grower from Louisiana moved to the drained lands of Illinois. According to his custom he raised his rows for corn. What difference in conditions did he forget?

2. A boy who was reared in Eastern Kansas went to farming in Western Kansas. As the untidy looks of fields planted by the lister method displeased him, he planted with a check-rower. Would you expect his corn to bear heavily?

3. "I always begin to plant corn on the 12th of March," said a farmer. Is this a wise rule?

4. A poor thinker had two fields to plant. One was very sandy, the other a heavy loam. The man did not want to change his planter, so he planted both fields one inch deep. On which would he be most likely to get the better stand?

5. A man, growing impatient over a late spring, plowed early, planted early, planted deep. What would you expect to find on visiting his farm in May?

POINTS FOR THOUGHT

1. Does every cornstalk require the same amount of water? If not, state the conditions under which it will need more or less rain. Would a two-inch rain in Florida, in July, do a cornfield more good than a one-inch rainfall in central Illinois at the same time?

2. Should silage corn ever be planted in checks?

3. Why would the check-row method of planting corn not suit the Appalachian section? Why would the lister method be unwise in most of Tennessee?

4. In what way does a very heavy rain sometimes keep corn from germinating? On what sort of soil would this be most likely to happen? Can you think of many more important things in farming than the proper control of moisture?

CHAPTER XVI

THE FIFTH STEP IN CULTIVATION — TENDING THE CROP

After corn seed is planted is there any need of cultivation before the tiny shoots push their way

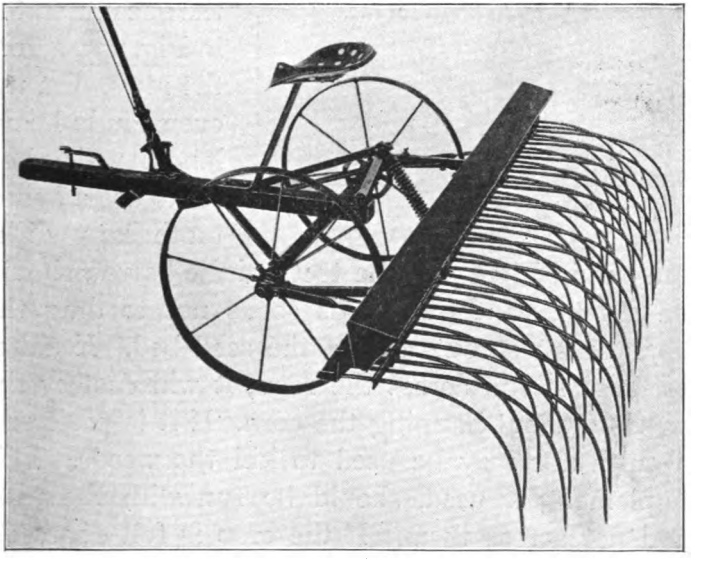


FIG. 157. A WEEDER

out of the soil? Often in a newly planted field weeds spring up ahead of the corn. If these weeds are allowed to grow, will they not be harder to kill

later on? Will not these weeds also use much plant food? Can the corn spare the moisture which the weeds are drawing from the soil? Will they not decrease the yield of corn by whatever amount of plant food and moisture they steal? Should they not be killed at once?

Can you kill these young weeds without injury to the sprouting corn? On light and level lands this can easily be done by running a weeder, similar to the one illustrated in Fig. 157, across the rows. On uneven and heavy lands it will be better to use a spike-tooth harrow like the one in Fig. 158. The teeth of the harrow should be set to slant backwards so as not to drag the young corn sprouts out of the seed bed. If either of these is run across the rows, it will destroy the weeds without harming the corn. If it is preferred, a cultivator may be used to kill the weeds. This implement, if used, should be run with the rows and not across them. If the crop is full of weeds, the cultural implements may be used several times. However, just as the corn is shooting out of the ground and is very tender, cultivation with the weeder or harrow should stop for a while. It can then be started again and kept up until the corn is

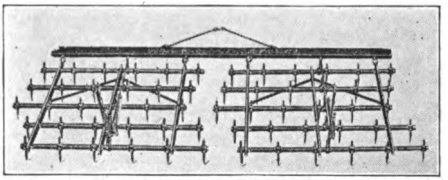


FIG. 158. A SPIKE-TOOTH HARROW

three or four inches tall. These early cultivations will not only destroy weeds but they will keep the ground from packing and thus save moisture and will also give the plants a vigorous start. If corn-stalks or rubbish have been turned under and remain unrotted in the seed beds, neither a weeder nor a

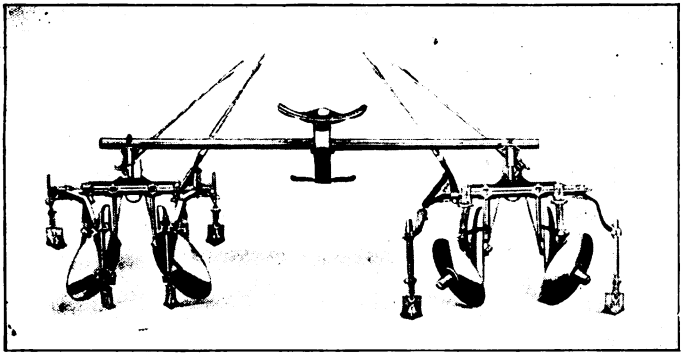


FIG. 159. A LISTER CULTIVATOR

harrow can be used. From the time the corn appears above the ground its growth should never be checked.

On listed land an implement known as the lister cultivator is coming into favor. It takes the place of the weeder or harrow in the earlier cultivations of corn planted by this method. Such a cultivator is shown in Fig. 159. On many farms this cultivator is not used until the lister ridges are somewhat leveled by one harrowing. At the first working of the corn by this tool the disks are set to throw the earth away from the corn. Fenders are provided to

keep the dirt from covering the plants. The earth, on striking these fenders, crumbles and sifts around the plants without bruising or burying them. At the second cultivation the disks are set wider apart and throw the earth toward the plants. Two cultivations usually put the soil in good condition and leave it level for the regular cultivators.

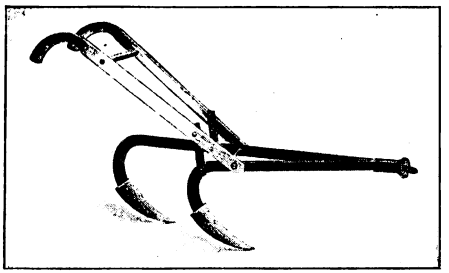


FIG. 160. CULTIVATOR WITH TWO SHOVELS

As soon as the plants are from three to five inches high you should start your cultivators. There are many kinds of cultivators, varying in style from the one-row walking cultivator with two shovels, shown in Fig. 160, to the large two-row riding cultivator, similar to the one in Fig. 161. The number of shovels attached to the cultivator varies from two to eight. The size of the shovels is usually smaller as the number grows larger. In some (see Fig. 162) disks take the place of shovels. In others, especially those made for later and shallow cultivation, long blades are used instead of shovels or disks. Still others have spring-tooth attachments.

What shall govern you in a choice of cultivators? In case your land is sloping or very uneven, can you

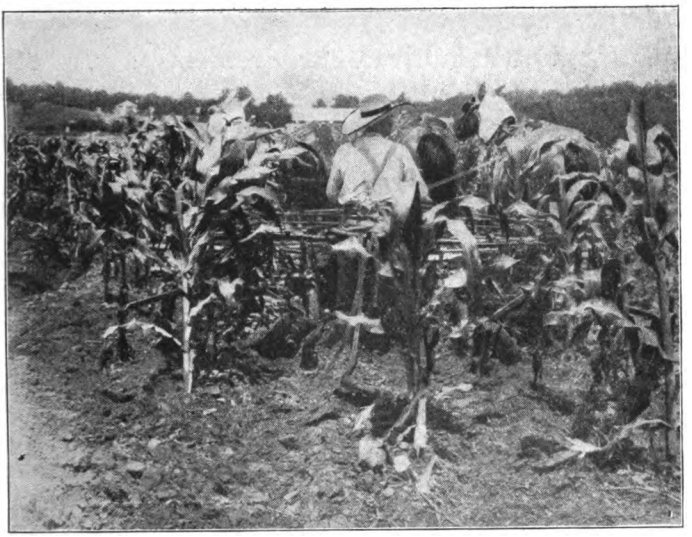


FIG. 161. TWO-ROW CULTIVATOR

FIG. 162. A DISK CULTIVATOR

use a two-row cultivator conveniently? In case your land is rather hard and packs easily, could you readily use small shovels? If weeds are tall and coarse, will you not have to select a cultivator with large shovels? When your land is in poor condition

FIG. 163. CULTIVATOR WITH SMALL SHOVELS

and needs fining, would not a disk cultivator be most successful? On stony land what would be gained by having a spring-tooth cultivator? In mellow lands, either sandy or full of humus, would not small shovels be most useful? On level lands would not a two-row cultivator save much time? Considering these changing conditions, shall you not select a cultivator to meet the needs of your farm?

Whatever kind of cultivator you select should be put to work when the corn is from three to five inches tall. Unless you allow weeds to grow too long, no other cultivating tool should be necessary. However, after your corn grows tall, will not a single-row cultivator, like the one in Fig. 164, have to take the place of the two-row cultivator?

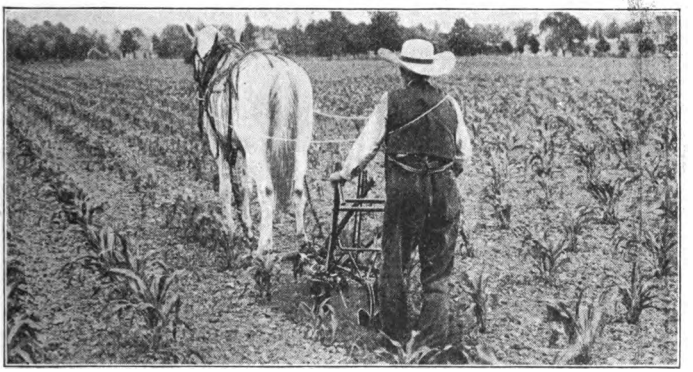


FIG. 164. A SINGLE-ROW CULTIVATOR

How deep in the soil must your cultivator run? Let us again turn to nature for an answer. Look at the roots of the corn plant shown in Fig. 165. This plant is only twenty-one days old. Then examine the root system of the ninety-day-old plant in Fig. 166. Will not the size and fullness of the ear depend on the amount of moisture and food the plant gets from these roots? If your cultivator goes deep enough to bruise, tear, or break these roots, can they properly nourish the stalk? Will shallow or deep cultivation

disturb these roots least? Is it not clear that your cultivating tools should not go crashing through these tender feeders of the plant? As the roots spread more and more with age should not your cultivations be less and less deep? Would it not be well to set the blades next to the corn more shallow than those working in the middle of the rows? Could the first cultivation be deeper than any of the others without injury to the plant? For the last one or two cultivations, after the corn is well grown, would it not be wise to take the shovels off the cultivator and put on scrapers? Could such scrapers be used for every cultivation except the first one?

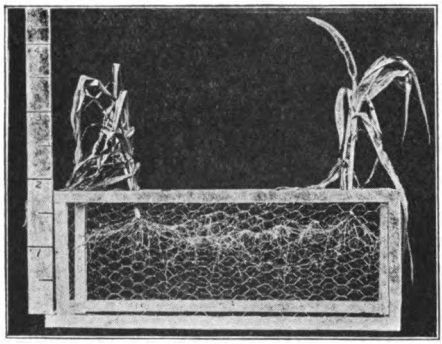


FIG. 165. ROOT SYSTEM AFTER TWENTY-ONE DAYS' GROWTH

Many farmers cultivate too deeply. Is there any good reason for this practice? To answer this important question we shall have to ask another; namely, What are the reasons for cultivating corn at all? It now seems that the two main reasons for working the soil around corn plants are as follows: first, to kill the weeds that seek to divide moisture

and plant food with the corn; second, to save all possible moisture for the ever thirsty corn plants.

Do either of these reasons demand deep cultivation? Evidently, unless you allow the weeds too much start, you can kill them with a shallow-running tool. The only way to save moisture in the spring and summer is to keep a dry mulch on the top of the soil. You can always do this with a shallow tool. Therefore, is there any reason for injuring the corn roots by useless deep cultivation? After the first cultivation the depth should decrease regularly from two or three inches to about one and a half inches for the later cultivations.

FIG. 166. ROOT SYSTEM AFTER NINETY DAYS' GROWTH

Many experiments have been made in different states to decide how often corn should be cultivated. Fields of corn have been cultivated from one to fourteen times to find out what number of cultivations brings about the largest yield. Will a study of nature's ways help to decide this vexed question?

You have noticed how clay lands and other stiff lands pack after a hard rain and form a crust on top of the soil. As soon as land packs in this way, do not the soil tubes which carry moisture to the surface form roads through which moisture escapes into the air? Can you afford to allow this moisture to be lost to your corn? What effect would running the cultivator have in preventing this loss? Would the cultivator not break up the soil tubes? Would not the mulch formed by the cultivator keep the moisture where the roots need it? Shall we not, then, make it a rule to cultivate such lands after every hard rain? Would loose, mellow soils pack in the same way? To save moisture will these loose soils need to be cultivated as often as the stiff soils?

Again, if lands pack and form a hard crust, what will happen when sorely needed showers fall? Will the water be able to sink down to the plant roots or will it run off almost as it would from a floor? If the land were loosened by a cultivator would the rain be thus lost? Then must we not cultivate often enough to keep the soil from so packing that the rain will be lost to the plant roots?

Of course no weeds or grass should be allowed to grow in the cornfield. We shall have, therefore, to cultivate as many times as is necessary to destroy weeds or grass; and in loose, mellow soils, which are not likely to pack, this is the main reason for cultivating. Such soils usually have sufficient warmth

and air. They take in water well, and soil tubes are not readily formed. Hence such soils do not need as frequent cultivation as the stiff ones.

Since these are the reasons for cultivation, will it not follow that cultivation is needed more frequently when the corn is young than it is after the corn is older? After the corn spreads its leaves over the rows, weeds do not grow so readily and there is not so great a loss of soil moisture. We must, however, bear in mind that the tasseling and silking time is always a trying time for corn. At that period light cultivation may save the moisture that is invaluable to a good harvest.

In cultivating your corn three thoughts should be uppermost: first, to make a bounteous yield; second, to do this at the smallest cost; third, to save all possible drudgery.

Good practical machines will enable you to do these three things. Hence, if you have to start with few machines, save in every way until you can supply your farm with excellent cultivating tools and implements.

APPLYING THE LESSON

1. A corn-grower sat on his fence and kept crying to his plowmen, who were cultivating waist-high corn, "Stick those plows in the ground." What do you think of his order?

2. In case a long wet spell stops your cultivation and gives weeds and grass such a growth that it is necessary to clear the crop with a plow, how would you set the plow?

3. A plowman who cultivated his surface-planted corn as deeply as his listed corn gathered more corn from his listed acres. He therefore decided that the listing method was the better. Did his experience prove that listing is the best method?

4. A farmer who had rich, mellow land, full of humus, bought a disk cultivator. Did he make a wise selection?

POINTS FOR THOUGHT

1. Corn will germinate sooner and more regularly if the seed bed in which it is planted is harrowed. Can you tell why this is true?

2. Why is a spike-tooth harrow better than a weeder for the first cultivation of stiff lands?

3. Is it well to have any fixed date on which to stop cultivating corn?

4. Why is it generally important to cultivate upland corn in the South to a later period of growth than it is in the Northern states?

5. Why can the first tilling with the cultivator be deeper than the later ones?

CHAPTER XVII

HARVESTING THE CROP

With the last cultivation of corn your labor on that crop ceases until harvest. If, however, you live in a climate in which summer legumes thrive, you should plant peas or beans in your corn. The corn, of course, drew nitrogen from the soil. Will not a leguminous crop restore the nitrogen to the soil by drawing a supply from the air? Will not such a crop furnish food for man and beast in case you cut it? Will it not add humus to the soil if you turn it under? A stirring farmer who knows that his success depends on keeping his land busy and fertile will plant as many legumes as possible.

FIG. 167. SOY BEANS SOWN AT LAST CULTIVATION

At what time shall you begin to harvest corn? The first illustration in this book shows in how many different states corn is grown. As many of these states differ in climate, and hence in the length of the growing-season, would you not expect corn to ripen at different times in these states? Must we not note, first, that the time of harvesting varies with the climate? As you know, there are early and late kinds of corn, and therefore the time of harvesting varies, second, with the variety planted. Note in Fig. 169 how marked is this difference. The center rows are ripe; the outer ones are still growing. If a field of corn has been well cultivated and freely fed, would it be likely to ripen earlier or later than a neighboring field which had been neglected and starved? Hence, does not the time of harvesting vary, third, with the care which has been given the crop? Again, would you think that moist bottom lands would ripen their crops as soon as dry uplands? Therefore, fourth, the time of harvesting

FIG. 168. CRIMSON CLOVER AFTER CORN

varies with the moisture in the land. Moreover, will not the date of beginning vary, fifth, with your plans for harvesting and with the purpose for which you harvest your crop? If you are going to use the stalks for silage, will you not harvest earlier than if you are to save only the ears?

FIG. 169. VARIETIES RIPENING AT DIFFERENT TIMES

Can we, then, with so many changing conditions fix any set date for harvest time? Evidently, no more than we can for planting-time. However, we can fix a period. We should harvest at such time as will give the greatest amount of good food in the ear, when we are to use the ears alone, or at such a time as will give the greatest amount of good food in ear and stalk, if we wish to harvest both. When will this be?

If you are to use the corn for silage, it should be cut when the stalk has its greatest weight. This will be when the ear is in the hard-dough, or glazed, state. The kernels at this time will be just beginning to dent. If the corn is to be eaten by hogs in

FIG. 170. HARVESTING BY MEANS OF HOGS .

the field, the ears should be allowed to become ripe before the hogs are turned into the field. When the corn is to be harvested for the ears and stover both, it should be allowed to stand until the kernels are rather deeply dented, the husks are dry and brown, and before many of the leaves below the ear have turned brown. When the corn is to be harvested for ears alone the longer it can stand in the

field without being injured by rain, frost, and cold the richer the ears will be in food.

There are six ways of harvesting corn: first, harvesting by means of hogs; second, harvesting for silage; third, harvesting by stripping the leaves for fodder and later gathering the corn; fourth, harvesting by cutting the tops above the ears for fodder and later gathering the corn; fifth, harvesting at one time for both ears and stover; sixth, harvesting for ears alone, and allowing animals to eat what they will of leaves and stalks.

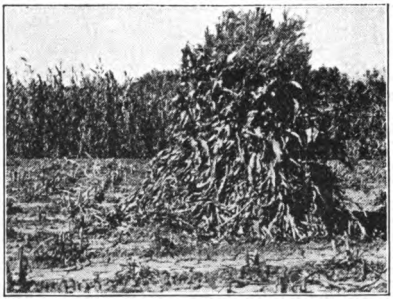


FIG. 171. HARVESTING BOTH EARS AND STALKS

First, "hogging," as it is called, is common in many sections. Farmers who have many hogs turn them into the cornfields to fatten. It is usual to plant some other crops, like rape, rye, pumpkins, peas, or beans, with the corn. The hogs generally strip the fields clean.

Second, with the increase in dairying, silos are beginning to be very common, and a much greater area is every year being planted in corn for these silos. As corn has been raised for silage in only comparatively recent years, this subject will be treated in the next chapter.

Third, in the Southern Corn Belt the practice of stripping the corn leaves for forage and gathering the ears at a later time is very common. As is shown in Fig. 173, the leaves, after being stripped, are tied to the stalks to dry. After they are dry they are bound in bundles and stored for forage.

FIG. 172. RAPE IN CORN

Is this a good practice? Would it not be wiser to let the blades remain until the corn is ripe, and then cut the entire stalk? Eight experiment stations in different states have tested the effect on yield which results from stripping the leaves from the growing plant. Each of these stations took a field that was uniform in soil and richness. They broke the land in the same way, planted it with the same sort of

seed, and cultivated it in the same way. The entire field was fertilized with the same kind of fertilizer. At the proper time half of the stalks were stripped of their leaves. The leaves on the other half were allowed to ripen with the ears. Then the yield from the stripped stalks and the yield from the unstripped stalks was accurately weighed. It was found that the yield of the stripped stalks was at least three bushels less than the yield from the unstripped stalks. On some of the fields there was even a greater loss from stripping. In Chapter V, p. 54, you learned that the leaves may be called the factory of a plant. In the leaves the food from the roots and the food from the air unite to form the food which is needed by all parts of the plant. This food is greatly needed in ripening the ear. If the leaves are stripped from the corn plant before its growth is finished, how can they form this food for the ear? Is not the ear more valuable than the fodder? Shall we not, then, conclude that "fodder pulling" is not only hot and disagreeable work but also that it too greatly decreases the yield for us to follow it?

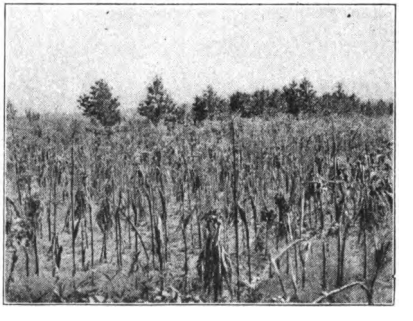


FIG. 173. STRIPPING BLADES BEFORE HARVESTING CORN

Fourth, harvesting by cutting the tops above the ears and then gathering the ears later is also a costly method. This "topping," as it is called (see Fig. 174), injures the plant in the same way that the stripping

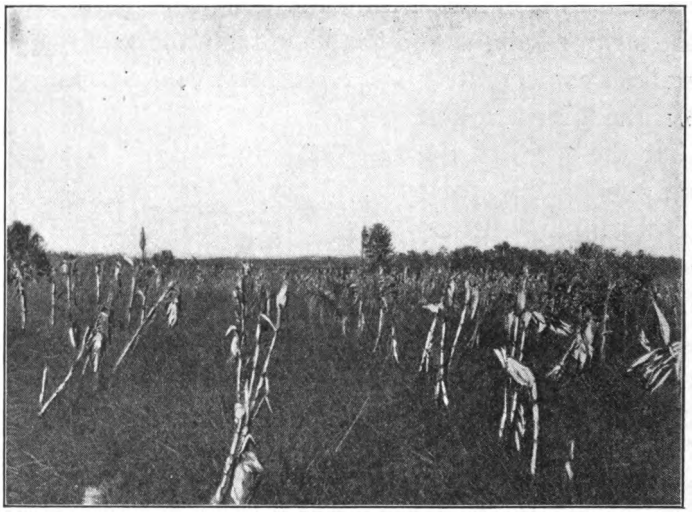


FIG. 174. CUTTING TOPS AND STRIPPING BLADES

of the leaves does, and considerably lessens the yield. It is a practice that should always be avoided.

Fifth, harvesting for both ears and stalk (stover) at the same time is far more usual than it was formerly. The improvement in machines for cutting the stalks and the increasing need for forage have led farmers in many sections to adopt this method. When you harvest in this manner you save leaves, stalk, shucks, and ears. If you harvest

too late, your stover will lose in value. Hence, will you not have to watch for a time least hurtful to ear and to stalk?

This time is found when the kernels are fairly dented and the husks and the lowest leaves are dry. Be sure to be ready to begin cutting as soon as this

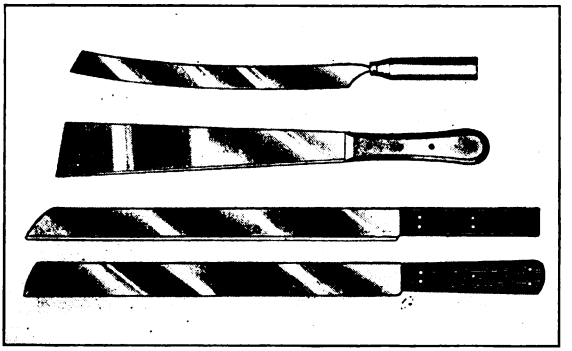


FIG. 175. KNIVES FOR CUTTING CORN

period is reached. Stalks left standing for two weeks after this stage is reached lose about one half of their feeding value. After the stover is shocked it should not be left too long in the field.

There are three methods of cutting corn:

First, on small farms or in sections where the stalks are very large and heavy, it is usually cut by hand. For hand cutting, sharpened hoes with short handles or corn knives similar to those shown in Fig. 175 are used. To save walking, the cutters should follow the plan shown in Fig. 176. Let the

cutter begin at the center of the square of eight rows. At this center, marked 0, he ties four stalks together to serve as a support for the shock. He then cuts stalk 1 and follows the numbers until he has cut stalk 8. These eight stalks are then carried to the center, and the shock is begun. The cutter then cuts stalk 9 and follows the numbers to 16, when the second addition is made to the shock. He continues to follow the numbers until he reaches 60. As you see, this method saves much walking.

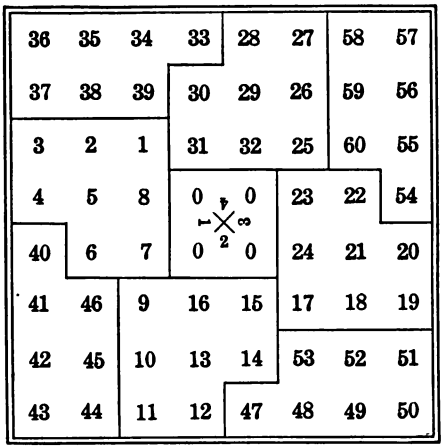


FIG. 176. SAVE STEPS BY FOLLOWING THIS DIAGRAM

Second, much corn is still cut by what is known as a corn-sled. The first form, a rude implement, was simply a sled with a knife in front for cutting one row at a time. Then a blade was put on each side of the sled, and two men and two horses cut two rows at a time. The labor for both horses and men was very wearying. The men, mounted on the sled, had to draw the corn against the blades and hold it until an armful was secured. Finally, wheels

were added and a more comfortable machine made. The improved corn-sled is shown in Fig. 177.

Third, where corn is largely grown and the land is level enough, a corn-binder and harvester is used. This machine is shown in Fig. 178. It cuts and binds the stalks into bundles. Then the bundles are gathered and shocked by hand.

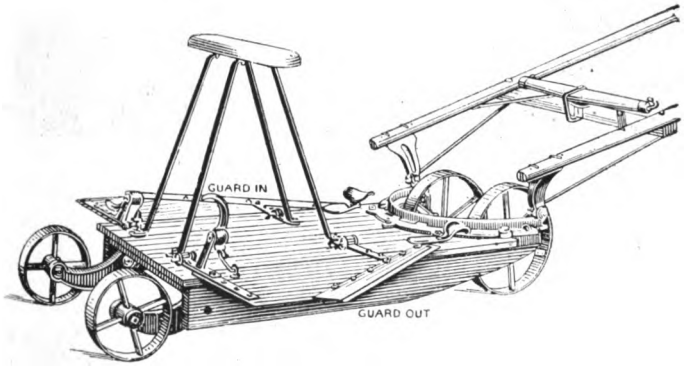


FIG. 177. CORN-SLED WITH KNIVES

So far as preserving your corn is concerned, will it make any difference in which of these ways you cut it? Will not the way in which you shock it, however, make a great difference? There are some things we must not forget in shocking our corn.

First, the shocks should, of course, be so set up as to keep out rain.

Second, the shocks should be so carefully set up that they will not fall or be easily blown over. They may be set up around a frame, called a horse,

FIG. 178. CORN-BINDER

FIG. 179. A CORN-HORSE

which is moved after the shock is finished and used for the next shock (see Fig. 179), or they may be grouped around several uncut stalks which are tied together. The shock should be securely tied near the top with binder twine.

Third, after the shocks have dried for about ten days the shrinkage of the stover will loosen the binding. This should be promptly tightened, or the shocks may fall. The device shown in Fig. 180 is helpful in tying shocks tightly.

FIG. 180. DEVICE FOR TIGHTENING SHOCKS

Fourth, unless the climate is dry and cool, do not make the shocks very large. Of course the larger the shock the larger amount of inside stover it will protect from the weather, but large shocks dry out slowly and hence are more likely to mold. Where small shocks are used they should be placed under shelter as soon as they are thoroughly dry.

Fifth, try never to leave your shocks too long in the field. Much rain dissolves from the stover palatable food of high feeding value. It also leaves the stover dry, brittle, and tasteless.

Sixth, set your shocks in straight lines, like those in Fig. 181, and at a good distance from one another. On good farms, where rotation of crops is the rule, a fall crop is often to be planted on the corn land. Hence it is frequently necessary to plow almost as

soon as the corn is shocked. If the shocks are in line and far apart, they will not greatly interfere with the plowing and seeding of fall crops.

There are three common ways of handling the shocks after they are dry. One is to husk the corn at the shocks and haul it to the crib, and leave

FIG. 181. SET SHOCKS IN STRAIGHT ROWS

the stover in piles for cattle. Another is to haul the shocked corn to the barn lot. There the ears are husked and stored, and the stover is either put in ricks at a convenient place for feeding, or is stored under a roof. In both of these ways the ears are husked by hand and the shucks are left on the stalk. Husking tools, similar to the ones in Fig. 182, are used to save the husker's hands. A still better way, where the cost is not too high, is to run the

stover through a shredding machine. Such a machine is illustrated in Fig. 183. The shredder removes

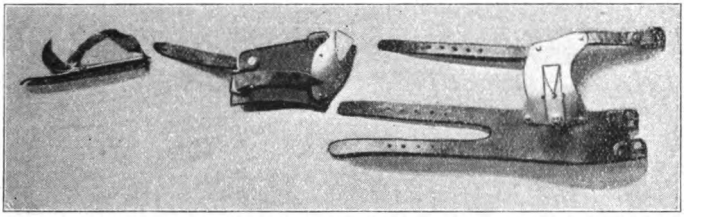


FIG. 182. HUSKING DEVICES

and partly husks the ears and tears the coarse stalks to pieces for stock food or bedding. The shredded stover is blown by a forced draft into the barn.

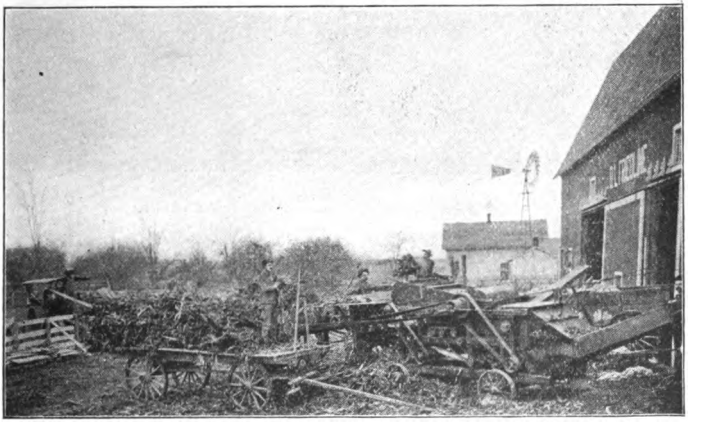


FIG. 183. HUSKER AND SHREDDER

The sixth way of harvesting is to husk the ears from the standing stalks. In this method only the ears are hauled to the place of storage. The stalks

are left standing and must be cut in the winter or spring. Unless labor is very scarce at harvest time this plan is wasteful. The stover is too valuable to be lost. In harvesting by this method a wagon with sideboards on one side, as illustrated in Fig. 184,

FIG. 184. WAGON WITH SIDEBOARDS

is usually driven along the rows. The huskers throw the ears directly into the wagon, and should load one wagon while another is making a trip to the crib.

In addition to these regular ways of harvesting, corn is sometimes grown and harvested for seed. When corn is grown only for seed, the stalk and ear should ripen undisturbed, and both should reach perfect maturity.

POINTS FOR THOUGHT

1. If you are anxious to get early roasting ears on the market, would you ever plant on poor land?

2. Boone County White is a large variety of corn. Iowa Silver Mine is small. Which of these varieties would usually ripen first?

3. Why should corn grown for silage be cut earlier than corn grown for stover?

4. If you have only a few hogs, should you ever harvest by hogging? Why should other crops be planted with corn when you intend to "hog" corn?

5. Why should silage corn be planted near the barn?

6. How big ought a corn farm to be before a man should buy a binder?

7. In what way are leaves a factory?

CHAPTER XVIII

CORN SILAGE

The storing of green fodder in a silo seems to have been suggested by a very old custom of storing grain in pits. After the grain was stored, it was covered with straw. Then the top was walled over with cement and stone. In Egypt more lasting rooms were built. They were air-tight and filled from an opening in the top. The opening was sealed after the storage space was filled. This method was adopted to preserve grain against a time of drought.

The Italians seem to have been the first to store green food in pits. As early as 1786 it is said that they preserved leaves for cattle in casks and pits. In 1843 an Englishman writes that in Germany he had seen green clover, grass, and vetch stored in pits. The green food was placed in pits which were ten or twelve feet square. Salt was scattered over the silage as it was packed, then the pit was covered with close-fitting boards, and earth was piled over the boards so as to keep out air.

A man named Samuel Johnson introduced the custom into England. He found that after the green food had fermented it kept well and was greedily eaten by cattle. The first recorded silos in America

were built only a year apart. Manly Miles of Michigan built one in 1875, and Francis Morris of Maryland built the other in 1876.

The silo came to America just as there was a remarkable increase in dairying. Hence dairymen were seeking food for their animals that would add to the flow of milk. The new food proved comparatively cheap and healthful, was easily fed, and greatly increased the quantity of milk given. Silage, therefore, met the needs of the dairymen, and since that time thousands of silos have been built. Experiments later showed that corn was the cheapest and most satisfactory material for silage, and large areas are now planted for silage alone.

How much silage should be grown on an acre of land? Will this not, like any other crop, vary with the richness of the land? Experiments have shown that the amount grown on an acre will be in proportion to the number of bushels of corn that the land yields. Land that produces thirty bushels to an acre ought to yield six tons of silage. Land that grows forty bushels should yield eight tons, and for each additional ten bushels there should be an increase of two tons.

For what reasons is silage so prized as an addition to farm foods?

First, a large amount of food can be packed into a comparatively small space. In addition, as the animals eat all of the stalk, there is no waste.

Second, silage is not only enjoyed by farm animals, but it keeps them in good health and improves their looks. It furnishes them with the same appetizing and nourishing food that they get from a summer pasture.

Third, feeding animals in the winter is cold and disagreeable work. Every farmer wants to lessen drudgery. Silage is a clean, convenient, and easily handled food.

Fourth, silage increases the flow of milk of a dairy herd. At the New Jersey Experiment Station a group of eight cows was tested for milk production. The cows were fed on stover from a certain number of acres, and the amount of milk produced on this food was carefully weighed. They were then fed on silage from the same number of acres. After the food was changed to silage the cows increased the amount of milk given 128 per cent. The butter fat in the milk of these cows increased 10 per cent. There was very little difference in the cost of the two foods. Similar experiments at other places have shown an equally large increase in the flow of milk.

On the other hand, we must remember that silage is not a cheap crop to grow, and that the labor of filling a silo is great. Happily, as seen in Fig. 185, much of this labor is done by machinery. The cutter is driven by power, and the silage is hoisted into the silo by an elevator. Still the cutter must

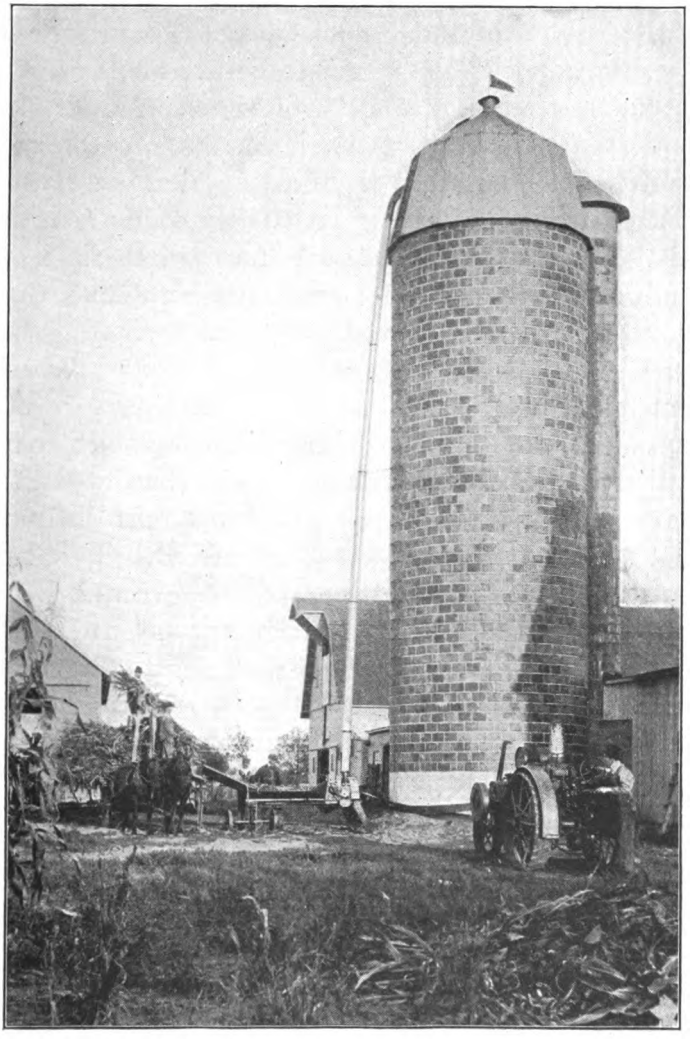


FIG. 185. FILLING THE SILO

be fed by hand and the silage must be packed by treading, and if too dry must be wet as it is packed.

Before planting a silage crop should you not plan to lessen labor and expense? Since the corn is cut and hauled when it is very heavy, would you not reduce expenses by having your silage fields near the silo? As you do not expect the corn to ripen its ears, can you not plant your silage corn thicker than your other corn? Would this thicker planting not give you more stalks to be cut into silage? Would you, with a view to saving labor and saving your machines, not select level fields for your silage corn?

Preparation of land for silage corn does not differ from the preparation for the regular crop. Will you not need the same deep, well-tilled seed bed? Shall you not have to keep the weeds killed and a dry mulch on your soil? As silage corn is to be cut before it matures, can you not wait to plant this corn until the labor of planting the main corn crop is finished? About how much seed to the acre should be planted for silage? Experiments seem to prove that from one fourth to one third more than for other corn is the best amount. Since the corn is to grow thick on the soil, would it not be wise to put the rows a little farther apart than is done for your main corn crop?

In deciding when to cut your silage corn you will have to put to yourself two questions. These are, Is the corn green enough to cut? Is the corn dry

enough to out? If it is too green at cutting time, you lose in food value, and the silage is so sour that animals do not like it; if it is too dry, there is a loss in weight and feeding value, and the silage will be difficult to pack and preserve. The time most favorable for cutting is when the ears are in the hard-dough state. At this time the kernels are just becoming dented and the lower leaves dry and brown. The crop may be harvested later, provided frost has not injured it and provided that the silage is watered while it is being put into the silo. It will not pack if it is too dry, and packing is necessary to keep out air. If air gets into the silage, the green material first molds and then rots.

If some of your corn is rather dry at cutting time, would it not be well to cut this first and pack it at the bottom of the silo? Why? When would you water all the silage as it goes into a silo?

Should every farmer have a silo? Not unless he has at least ten cows to feed. The expense of building a silo and of buying the machinery needed to fill it is too great for feeding a small herd.

APPLYING THE LESSON

1. If a field yields fifty bushels of corn to an acre, how many tons of silage should it produce?

2. An average Jersey cow is fed about thirty pounds of silage a day. How long will a silo holding one hundred tons feed ten such cows at the same rate of feeding?

3. Silage must be packed well to preserve it. Should you, then, set your machine to cut the stalks in short lengths, say from one-half to one inch, or in longer lengths, say three or four inches?

4. Two brothers, who each have a fine calf, are preparing these calves for a January calf show. One is feeding his calf on stover for roughage. The other is feeding silage. Which is most likely to win the blue ribbon?

5. If a cow were giving two gallons of milk a day and a silage ration increased her milk 128 per cent, how much milk would she yield?

POINTS FOR THOUGHT

1. Why is it necessary to water silage if the corn is dry?

2. Would it be economical to begin feeding silage early in the fall?

3. You have noticed how stock improves on a summer pasture. Is silage the same sort of food that is enjoyed in the pasture?

4. A man who was not used to silos built a wooden one. Fearing that water would injure his silage, he bored auger holes in each side near the bottom to drain the silo. Was this wise?

5. A man who wanted to plant twenty acres in silage corn selected a broken field over a mile from his silo. What mistakes did he make?

CHAPTER XIX

STORING THE EARS

The ears for which you have worked all summer are now ready for storage. Surely, after your labor and your outlay in producing them, you will not be careless about their storage. How shall you store the ears so that not one shall be lost from neglect? If your mind suggests clear answers to the following questions, your corn will be properly housed:

First, should corn ever be stored before it is fully matured and thoroughly dried?

Second, should air not circulate through your crib?

Third, should the crib not be so built and kept in repair as to keep moisture from the corn? To this end, how far over the front and rear of the crib should the gables extend? Should the roof come well down over the sides? Can you afford to have even a small leak in the roof?

Fourth, shall you store the corn in the ear or after it has been shelled?

Fifth, if weevils or mice are troublesome would it be best to store your ears without husking them?

Sixth, since mice, rats, and birds devour much corn, should you not line your crib with wire netting and take any other needful steps to keep them out?

Seventh, should you not take care that your corn is so dry when it is gathered and kept so dry in the crib that it cannot freeze?

To give free passage for air, to keep out mice, rats, and birds, and to keep the corn perfectly dry,

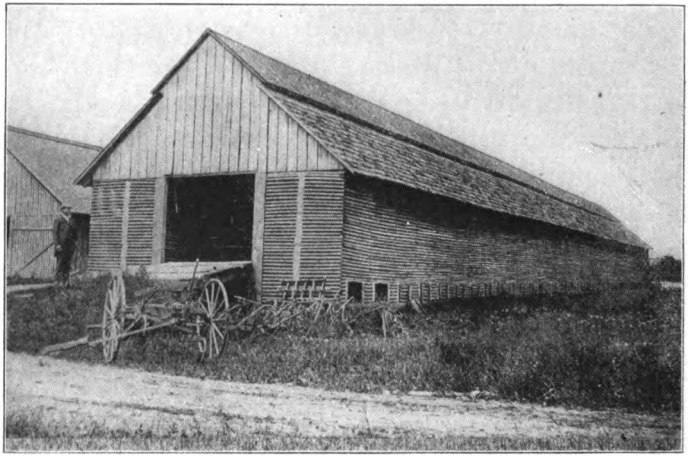


FIG. 186. CRIB WITH PROJECTING ROOF

ventilated sheet iron cribs with wide gables and projecting roofs are easily built. If such a crib is set on protected piers, it makes an excellent storage house. Wooden cribs which are well aired, lined with wire netting, and set on rat-proof piers preserve the corn equally well. It is often convenient to know how to calculate the amount of shelled corn that the ears stored in a crib will measure. To get this amount, if the crib is full, multiply

together the number of feet in the height, width, and depth of the crib. Then divide the number resulting from the two multiplications by 2.50, which is the number of cubic feet of corn on the ear that will make one bushel of shelled corn. The quotient will be the number of shelled bushels sought.

No matter how prudently you store your corn there will always be a shrinkage in weight after it is stored. Even fairly dry corn, housed with the utmost care, will shrink from 5 to 15 per cent. This loss, of course, is due to the evaporation of moisture from the cob and kernels. The amount of moisture lost will vary with the dryness of the corn at gathering time, and the weather conditions following the harvest. If the fall is wet, there will be little loss of moisture, and hence not much loss in weight. If the fall is very dry, however, there will be a steady loss in weight. The greatest shrinkage is in November, just after the harvest; the next greatest shrinkage is in April and in May, when spring warmth hastens the drying out.

POINTS FOR THOUGHT

1. Should you gather and store your corn just after a rain?

2. Why should air circulate through a crib?

3. In case you have many weevils in your crib would you husk your corn before you stored it?

4. If a crib is thirty feet long, twenty feet wide, and ten feet high, how many bushels of corn will it hold?

5. Suppose the amount of corn stored in the crib which you have just calculated lost 5 per cent in weight from shrinkage, how much in pounds would the total loss from shrinkage be — counting one bushel of eared corn at seventy-six pounds?

6. What changes in your home crib can you make to protect it from mice and rats?

INDEX

Africa, corn in, 1
Alexander, Corbett, 25
America, corn in, 1, 9, 10
Asia, wheat and oats in, 9

Bag for seed corn, 105
Barren stalks, 57, 58, 75, 76
  prevention of, 76
Blades, 4
Boys' corn clubs, 7, 12, 76
Breeding patch, 109–112
Butts and tips, 34, 35, 65, 84, 85, 93, 138
Butting and tipping, device for, 197
Buying seed, 63, 64, 65, 66, 94, 95

Cartier, Jacques, 9
Check-row method of planting, 110, 198–200
Chit, 32
Circles, showing production by states, 5
Clean-culture crop, 158–160
Climate, for corn, 17
  effect of, on date of harvesting, 71, 216, 217
Clover, 153–158, 160
  cut for hay, 157, 158
  danger in turning under, 157
  for silage, 232
  turned under, 157, 158
Cob, 40, 41, 57, 58, 59, 60, 85, 91, 92
  color of, 86, 87
  size of, 88, 89
  uses of, 4
Columbus, Christopher, 9
Corn, affected by temperature, 23
  after corn, 158–160
  after tobacco, 160
  Bible use of word, 9
  dent, 33–36, 41–43, 59
  description of, by Pilgrim writer, 14
  distribution of rainfall affecting, 21–23
  earliest description of, 10–12
  earliest picture of, 10
  flint, 35–36, 40–42, 59
  flowers of, 56
  growing-days of, by states, 27, 28
  growth of, in South Africa, 23
  home of, 9, 17
  ideal season for, 22
  importance of, to colonists, 13
  importance of, to Jamestown colony, 10
  importance of, to Puritans, 10
  legumes increase yield of, 153–158
  length of growing-season of, 27–29
  man's work for, 61
  map showing yield of, by states, 5
  measuring, in crib, 8
  moisture in, 115
  nature's work for, 61
  planted on stubble, 150–158
  pod, 31, 33, 39
  pop, 31, 33, 37–39, 41, 43, 59
  price of, per bushel, 6
  rainfall required for, 19–21
  seed of, sent to Old World, 15

Corn, soft, 33, 39
soil for, 140
sweet, 33, 36, 37
time required to ripen, 19, 27–29
water needed per bushel, 19
world's supply of, 6
yield of, per acre, 7
Corn Belt, 7, 24–28, 185, 199, 200, 220
limits of, 7
states comprising, 23
temperature of, 23, 24
Corn-binder, 225, 226
Corn crib, calculating contents of, 240, 241
for seed ears, 239–241
rat-proofing of, 239–240
ventilation of, 240, 241
Corn crop, bushels exported, 3
bushels grown in United States, 1
bushels manufactured into starch, sirup, and sugar, 3
climate for, 17
doubling of, 7
extent of, 1
forms in which used, 3
history of, 9
importance of, 1
map showing production by states, 5
treatment of, 1
uses of, 3, 4
varying elevation affecting, 17–19
wagons needed to haul, 2
Corn farm, buying of, 17–29
Corn-horse, 225–227
Corn oil, uses of, 3
Corn-planter, 46, 183, 186, 196, 198
Corn production, possibilities in the North, 24, 26–28
possibilities in the South, 24, 26, 27
Corn roots, spread of, 209–211
Corn sirup, 3
Corn-sled, 224, 225
Cotton, home of, 9
Cotton Belt, 7, 185
Cover crops, 154, 155
Cowpeas, 153–155, 159
Cultivation, depth of, 209–211
fifth step, 203
first step, 150
fourth step, 182
objects in view, 213
reasons for, 210, 211, 213
second step, 163
third step, 175
times needed, 55, 211–213
time to start on young crop, 209, 212, 213
too deep, 210, 211
Cultivator, 204, 205
disk, 207, 208
kind to select, 206–209
lister, 205, 206
single, 206
spring-tooth, 208
two-row, 206, 207
Cutting corn, diagram for saving steps in, 223, 224
methods of, 222–225

Dent corn, 31–36, 42, 43
number of ears to stalk, 59
why a favorite, 41–43
Dextrin, uses of, 4
Disking, 151–153, 158, 178, 179
advantages of spring, 179, 180
benefits of, 151–153
Drainage, 186–189
Drake, Z. V., 140

Ears, butts of, 84, 85
change of height, 70–73

Ears, color of cobs, 86, 87
color of kernels, 86, 87
favored, 94, 97, 99, 101, 110
girth of, 83, 84
height of, 69–72
heredity of, 63, 64, 94
kinds to select, 97, 98
length of, 83, 84
number needed to plant an acre, 99
number of rows of kernels on, 59
number of, to stalk, 78–80
partly filled, 57, 58
qualities of, 81, 82
race qualities of, 40, 41
ripening time of, 72, 73
shanks of, 74, 75
space between rows of kernels on, 85, 86
storage of, 239
storehouse of the plant, 53
tips of, 84, 85
ways to house, 239, 240
Elevation, effect of, on corn, 17
effect of, on length of growing-season, 18, 19
influence of, on maturity, 18
Endosperm, 3, 4, 34–38, 46, 48, 49
basis of classification, 33
color of, 8
defined, 33
products of, 4

Farm, choice of, for growing corn, 17–29
Ferdinand, King, 9
Fertilizer, fish used as, 10, 14, 16
Fining the soil, 49
Flint corn, 31, 33, 35, 36, 40–42
adapted to cold climates, 42
number of ears of, to stalk, 59
size of crop of, 41
Flowers, 55–57
Fodder pulling, 54, 219–222
Food, from air, 52, 53
from soil, 52, 53
Fursman, E. S., 140

Germ, 3, 31, 32, 46, 49
color of, 8
foes of, 113, 114
importance of, 113
products of, 3
Germination, 182, 195
Germination box, cover cloth for, 127
covering of, 128
packing sawdust in, 128
placing kernels in, 127
preparation of, 126
raising sides of, 128, 131
removing kernels for, 127
section of, 133, 137
top cloth for, 128
top cloth removed from, 132
Germination tests, 121
reading of, 132, 137
waiting for results of, 131, 132
Gluten, 32, 33, 46
Grass, for silage, 232
Growing-season, length of, for several states, 27–29, 71, 184–186

Hall, Sherman, 6
Hariot, Thomas, 11, 12
Harrow, cutaway, 171
disk, 151, 157, 158, 178
setting of, for young corn, 204, 205
smoothing, 178, 180
spike-tooth, 204
spring-tooth, 206
Harrowing, 49, 170, 178–180
advantages of, for young plants, 204, 205

Harrowing, advantages of spring, 179, 180
moisture loss lessened by, 156
Harvesting, 215
for ears alone, 218, 219, 229, 230
for ears and stover, 218, 219
effect of variety on, 216, 217
by hogs, 218, 219
for seed alone, 230
for silage, 217–219
stage of maturity for, 218
for stover, 218–219
time to begin, 216–218
wagons for, 230
ways of, 219–223
Heredity, 63–67, 70, 94
Hogging, 219
Hull, 3
Humus, 140, 155, 157–160, 167, 168, 172, 179, 208, 215
Husker and shredder, 229
Husking, device for, 229
Husks, 42, 58
products of, 4
uses of, 74

Indians, clearing cornland by fire, 15, 16
cooking corn, 11, 12
crushing grains, 13
using fish as a fertilizer, 10, 14, 16
Isabella, Queen, 9

Jamestown, 10, 13
Jefferson, Thomas, 163
Johnson, Samuel, 232
Joseph, 9

Kernels, 48, 56, 57
basis of race division, 31
color of, 86, 87
Kernels, growth of, 49
inspection of, 123, 124
number of, for germination test, 124
number of, to ear, 59
number of, varies with kinds, 59
parts of, 32
planting of, 46
power of, to sprout, 92
qualities of best, 92
qualities of good, 121–123
race qualities of, 39, 40
shape of, 32, 89–92
size of, 89–92
space between, 85, 86
Knives for cutting corn, 223

Lapping, 181
Leaves, 68
as food gatherers, 53
Legumes, 160, 185
between corn rows, 159, 160
defined, 153
effect of cutting, for hay, 155
effect of turning under, 155
summer, 153–156, 215
ways in which crops are helped by, 153–158
winter, 156–158
winter, following summer, 154, 155
Lister, 192–194
Listing, advantages of, 194, 195
methods of, 192–195
objections to, 195

Map, showing production by states, 5
Manure, 158, 159
Manure-spreader, 159
Maturity, effect of elevation on, 18
Methods of storing seed ears, 116–119
"Middle buster," 192

Miles, Manly, 233
Moisture, effect of, on planting, 200, 201
loss of, 179
lost by "steaming," 156
saving of, 169, 170
sufficiency of, for large growth, 19, 198
Morris, Francis, 233
Mulch, 156, 170, 211, 212

Navajo corn, 22
Nodes, 58
North, corn production in, 24, 27, 28
Nubbins, 75, 198

Oats, 150
Oil, from corn, 3

Parker, Charles, 140, 141
Pith, products of, 4
Plant, conditions for growth of, 45
early growth of, 45
first food of, 45
functions of each part of, 53, 54
the growing, 45
how it feeds, 32, 33, 52, 53, 67
moisture for, 45, 48, 49
parts of, 46
seed bed for, 175
warmth for, 49
Planting, 182–202
in accord with nature, 182–188
check-row method, 189, 190
check-row, seeds to each check, 199, 200
depth of, 200, 201
distance of plants in row, 200
distance of rows, 200
in drained lands, 188–190
drill-row method, 190, 191
Planting, effect of warmth on, 183–186
hand method, 195, 196
lister method, 191–195
in poor lands, 199, 200
ridge method, 199–201
ridging for wet lands, 186–189
surface method, 189, 191, 192
time for, 182–186
Planter, 46
check-row, 198
double-row, 186
hand, 196
setting of, 196
single-row, 183
Plow, 163
early forms of, 163, 165
inventors of, 163
modern forms of, 163, 165
Plowing, depth of, 155, 171–173
effect of, on insects, 169
effects of, on soil, 169, 170
fall, 167–172, 178
ground too wet for, 174
reason for, 163, 164
schools to teach, 166
spring, 156, 157, 167, 172
suggestions for depth of, 172, 173
things not to do in spring, 173, 174
things to do in spring, 172
what it does, 166
Pod corn, 31, 33, 39, 40
Pollen, 56, 57, 72, 73, 100
Pollination, 57, 58, 72, 73
affected by height of stalk and ear, 72
affected by rainfall, 23
Pop corn, 31, 33, 37–38, 41, 43
explanation of popping of, 38
number of ears to stalk, 59
size of crop, 41

Pop corn, uses of, 43
Pop-corn machines, 43
Population of United States, 4
Portuguese scatter corn, 15
Preparation of soil, 150–160
  advantages of early breaking, 167–171, 173, 174
  benefits of disking, 151–153
  breaking for corn, 167, 168
Prize acre, barren spots to be avoided in, 142, 143
  fields to select for, 144, 146–148
  legumes in, 147, 148
  poor soil avoided in, 142, 143
  selection of, 141–148
  trees to be avoided in, 144–146
  weeds to be avoided in, 144, 146
  wet land to be avoided in, 142, 144, 145
Prize ears, 61, 62
Prolific corn, 78–80, 108

Races of corn, 31
  how classified, 31
Raleigh, Sir Walter, 11
Rainfall, 186–188, 192
  distribution of, in Arizona, 20
  distribution of, in Corn Belt, 21
  distribution of, in Georgia, 14
  distribution of, in Iowa, 21
  effect of, on pollination, 23
  effect of, on soil, 212
  required for corn, 19
  at silking and tasseling time, 23
Rape in corn, 220
Ridging wet lands, 186–189
Roanoke Island, 11
Root hairs, 52, 53, 168
Root sprout, 49, 50
Root system, 50–52
Roots, spread of, 55, 209–211
Rose, Alfred, 140
Rotation of crops, 186
Rows, distance apart, 196
Rye, 150, 160

Sap current, 53
Sawdust, preparation for germination test, 125, 126
  removing excess water from, 126
Sawdust plan of testing corn, 121
School children in America, 6
Season, ideal, 22
Seed, adaptation of, 66, 67
  bagging of, 138, 139
  buying of, 63–65, 66, 94, 95
  care of, 139
  crib selection of, 98
  ears to select from, 97, 98
  effect of climate on, 95
  effect of elevation on, 65
  effect of soil on, 95
  family record of, 97
  harvesting of, 230
  home-grown, 65, 67, 94, 95
  improvement of, by grower, 96–112
  labeling, 138, 139
  looks of, may mislead, 93–95
  from neighboring farm, 95, 96
  selection of, from field, 98–100
  showy ears, 64
  stalks to select from, 97–99
  stealing a neighbor's, 60
  storing, 113
  value of good, 62, 63
  ways of selecting, 63–67, 93
Seed bed, 175
  preparation of, 176–180
Seed ears, arranging, for germination test, 121
  butting and tipping, 138

Seed ears, crib for, 239–241
drying and storing, 107, 108
final selection of, 106–108
foes of, 239, 240
how injured, 113, 114
how improved, 62
inspection of, 123, 124
manner of final selection of, 107, 108
markings of, 61, 78
method of gathering, 105, 106
methods of storing, 116–119
moisture injurious to, 107
objections to row selection of, 106–108
one-eared varieties of, 108, 109
prolific varieties of, 108, 109
shelling, by hand, 138, 139
shrinkage of, 241
testing of, 121
time of gathering, 107
unimproved, 62
Seed selection, ear-to-row method of, 109–112
field to use for, 100, 101
first examination, 101
marking selected ears in, 103
notes on, 68, 74, 76, 80, 89
number of ears to select, 99, 100
place and manner of, 93
plants to reject in, 101, 103
second examination, 104–106
time to begin, 98, 100
Shank, 58, 74
Shocking corn, methods of, 225–228
Shocks, 228, 229
device for tightening, 227
handling of, 228, 229
Silage, 232, 237, 238
amount of, per acre, 233
amount of, for a cow, 237
Silage, an expensive crop, 234
history of, 232, 233
land for, 233, 236
packing of, 236–238
plans for lessening expense of, 236
preparation of land for, 236
reasons for prizing, 233, 234
seed per acre for, 236
time to harvest, 217–219
watering as packed, 237
when to cut, 236, 237
Silk, 46, 54–57, 73
Silo, 238
in America, 233
filling of, 234–236
who should have, 237
Smith, John, 10
Soil, effect of freezing and thawing on, 168
preparation of, 49, 150–160
Soil for corn, 140
Soil tubes, 157, 179, 212, 213
South, corn production in, 24, 26
Soy beans, 153–155, 159
Spaces, between kernels, 83
between rows, 84
Stalks, barren, 57, 58, 75, 76
distance apart, 198, 199
kinds of, to select seed from, 97–99
parts of, 55
products of, 4
qualities of, 67
varying height of, 70–72
Stem sprout, 52
Starch, 3, 32
Storage house, 115
Storage of seed ears, 116–119, 239, 240
Storage room, 113
Stover, 218, 222, 223, 230

Suckers, 43
Sugar cane, home of, 9
Sweet corn, 31, 33, 36, 37, 40, 41, 43
  uses of, 43

Tassel, 46, 54–56, 60, 73
Temperature, effect of, 23, 24, 27–29
  of Corn Belt, 23, 24
Tending the crop, 203–214
Time to begin harvesting, 216–218
  varies with amount of moisture, 216
  varies with care, 216, 217
  varies with climate, 216, 217
  varies with purpose, 217
  varies with varieties, 216, 217
Tip cap, 32
Topping, 222

United States Department of Agriculture, 4

Vetch, 153
  for silage, 232

Water, amount of, needed for growth of corn, 60
  uses of, by corn plant, 55
Webster, Daniel, 163
Weeder, 203, 204
Weeds, 203, 204
Wheat, 150
  home of, 9
White, John, 10, 12
Winter wheat states, time for seeding in, 185

Yield per acre, average, 7
  effect of height on, 70–72